RAILROAD GAZETTE

FRIDAY, FEBRUARY 18.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings Next Week.—Delaware, Lackawanna & Western, in New York; Camden & Atlantic, Camden, N. J.

Elections.—Avon, Genesee & Mt. Morris, President, G. H. Harris; Secretary, G. W. Phelps.—Galveston, Sabine & St. Louis, Richard J. Evans appointed Receiver.—Ohio Railroad Commission, William Cappeller, Commissioner.—Ohio & Mississippi, E. P. Cutter, Secretary.—New York, Lake Erie & Western, R. H. Soule, General Manager; J. W. Cloud, Superintendent of Motive Power.—Union Pacific, Judge A. C. Haskell, Government Director.—Virginia & Western, A. S. Buford, President; W. T. Townes, Secretary and Treasurer.—West Shore, Charles E. Lambert, General Passenger Agent.—George W. Crocker, Massachusetts Railroad Commission.

Personal.—William H. Stevenson resigns Superintendentship of New York & New Haven's New York Division. Dead: Thomas Russell, Henry C. Bixby.

Earnings.—To January 31, roads report earnings, all showing increase for the month.

Traffic.—Anthracite coal shipments, 524,911; Eastern bituminous, 28,568; coke, 93,418; Chicago shipments Eastward last week, 50,019.—Cotton receipts, interior markets, for week ending Feb. 11, 55,048; seaports, 108,257 bales. Cotton in sight to Feb. 11, 1,224,293 bales.

Changes and Extensions.—Central of New Brunswick progresses with new construction in Kings County, N. B.—Chicago, Kansas & Nebraska extends line from Hebron, Neb., to Nelson, 30 miles.—Chicago, Milwaukee & St. Paul completes tracklaying from Gault, Mo., to Chillicothe.—Denver Terminal proposes to build line across Colorado.—Havana, Rantoul & Eastern will be changed to standard gauge.—Kansas City, Wyandotte & Northwestern completed to Menager Junction, Kan., 17 miles from Wyandotte.—Leroy & Caney Valley Air Line is opened to Elk City, Kas.—Maine Central will extend road from Portland to Cumberland Junction, 7 miles.—Michigan Central extended branches in Michigan.—Nashville, Chattanooga & St. Louis is extending its road in Tennessee and Alabama.—Rome and Decatur continues work of construction in Alabama.—San Francisco & North Pacific completes survey on California extension.—San Bernardino & Los Angeles lay track from San Bernardino, Cal., north 5 miles.—Southern Pacific extends branches in California.—Union Pacific will build a road from Rock Springs, Wyoming, to Yellowstone Park.—Virginia & Western institutes survey in Virginia.—West Shore surveys line to Kaaterskill Hotel, Catskill Mts., N. Y.—Norfolk & Western extends line in Virginia.

New Companies Organized.—Chicago, Peoria & St. Louis, new organization to operate leased lines of the Wabash, St. Louis & Pacific system.—Crookston Southwestern incorporated in Minnesota.—Kansas Valley obtains charter for a road from Kansas City, Mo., to Denver, Col.—Pittsburgh, Chicago & Missouri River incorporated at Springfield, Ill.—San Pablo & Tulare Extension is incorporated at San Francisco, Cal.

Reports and Financial.—Boston & Albany for quarter ending Dec. 31 shows gain of 2.3 per cent. gross, but loss of 9.4 per cent. net.—Boston, Hoosac Tunnel & Western for quarter ending Dec. 31 shows gain of 21.6 per cent. gross and 85.2 per cent. net.—Cincinnati, New Orleans & Texas Pacific for 1886 shows increase of 7 per cent. gross and 6 per cent. net.—Denver & Rio Grande for the year of 1886 shows a gain of 10.1 per cent. gross and 14.9 per cent. net.—Manhattan, three months to Dec. 31, shows increase of 11.5 per cent. gross, but only 0.7 per cent. net.—New York Central & Hudson River for quarter ending Dec. 31 shows gain of 31.1 per cent. gross and 29.9 per cent. net.—New York, Chicago & St. Louis for quarter ending Dec 31 shows gain of 24.1 per cent. gross and 28.3 per cent. net.—Ogdensburg & Lake Champlain for quarter ending Dec. 31 shows gain of 20 per cent. gross and 3.9 per cent. net.—Rome, Watertown & Ogdensburg for 1886 shows gain of 41.3 per cent. gross and 66.4 per cent. net.

Miscellaneous.—Atchison, Topeka & Santa Fe issues circular concerning new rights in stock of Chicago, Kansas & Western and other roads.—Columbus, Hocking Valley & Toledo, President Shaw files injunction suit against ex-officers and stockholders of this company.—Central Mexico Railroad Co. will build the branches of Mexican Central in Mexico.—Dubuque & Sioux City Co.'s rival faction elect different boards of directors. Central Pacific is blocked with snow between Colfax and Cisco, Cal.—Illinois Central gives mortgage to United States Trust Co., N. Y., for $9,000,000.—New York, Chicago & St. Louis settles claims of equipment bondholders for $3,443,968.—Panama Railroad Co. comes to a settlement with the Pacific Mail Steamship Co.—Peoria, Decatur & Evansville gives mortgage for $2,085,000 to Central Trust Co., N. Y., and W. A. Heilman, of Evansville, Ind.—Southern Pacific buys the San Joaquin ranch in California.

London Underground Traffic and Rates.

The Metropolitan Railway Co. of London, in its report for the calendar year 1886, shows for the last six months of the year an increase of net income of $18,165 over the same item for 1885. The passengers carried and the gross receipts have been since 1863 as follows:

Year.	Number of passengers.	Gross receipts for passengers, goods, minerals, and tolls. £
1863	9,455,175	101,707
1864	11,721,889	116,489
1865	15,763,907	141,513
1866	21,273,104	210,242
1867	23,405,382	233,180
1868	27,708,011	284,243
1869	36,893,791	374,083
1870	39,160,849	385,372a
1871	42,765,427	396,068b
1872	44,392,440	401,390
1873	43,583,973	408,382
1874	44,718,225	411,550
1875	48,302,324	448,364c
1876	52,586,295	475,792d
1877	56,175,753	490,828
1878	58,807,038	494,873
1879	60,747,553	506,204e
1880	64,759,573	526,213f
1881	67,621,670	551,776
1882	69,357,183	556,999g
1883	74,204,301	603,768h
1884	75,926,262	603,751i
1885	77,170,601	591,981j
1886	80,474,550	616,269
Total	1,145,325,276	9,931,037

a District Railway opened to Blackfriars Bridge May, 1870.
b District Railway opened to Mansion House July 3, 1871.
c Extension to Bishopsgate opened July 12, 1875.
d Extension to Aldgate opened Nov. 18, 1876.
e Extension Swiss Cottage to West Hampstead opened June 30, 1879, and from West Hampstead to Willesden Nov. 24, 1879.
f Extension to Harrow opened Aug. 2, 1880.
g Extension from Aldgate to Trinity Square, opened Sept. 25, 1882.
h St. John's Wood Railway receipts included as from Jan. 1, 1883.
i Inner Circle completion and extension to East London Railway opened Oct. 6, 1884.
j Extension from Harrow to Pinner opened May 25, 1885.

The average receipts per passenger in 1873 was 2.148d. or 4.296 cents, while in 1886 the average rate was 1.740d. or 3.48 cents. As the payment is somewhat proportional to distance, the fares for the longer distances are about the same as the N. Y. elevated and for short distances much less.

Some Notes on the Working Stress of Iron and Steel.

At the Fourteenth Meeting, 1886, American Society of Mechanical Engineers, the following paper was presented on the above subject by Mr. Benjamin Baker, M. Inst. C. E.:

The author has selected the above somewhat elastic title because, whilst anxious to accede to the request to bring certain results of his experience before the society, he has not had sufficient time in the pressure of other duties to analyze and arrange these results as he could wish.

Few engineers of experience who have had to deal both with machinery and with structural ironwork, such as railway girders, can have failed to note inconsistencies in practice, and general vagueness as to the meaning and use of such terms as safe working stress of factor of safety. Rankine defines factor of safety as the ratio in which the ultimate strength exceeds the working stress, and assigns to it a value of four to six for ordinary steel and iron subject to a variable load. But if we consider for a moment how the proportions of almost all parts of a machine, from the axle of a country cart to the coupling rod of an express engine, have been arrived at, we shall see that it has been by the gradual strengthening of the parts which had proved by accumulated experience to be too weak, and not by calculating the dimensions on the basis of a factor of safety of four to six.

To illustrate this fact we cannot, indeed, select a better example than that of the coupling rod of a locomotive engine. Thirty to forty years ago the coupling rods in general use were round rods about 2⅝ in. in diameter at the centre and a trifle smaller at the ends. They were next changed to flat rods about 3½ in. deep by 1¼ in. thick, and subsequently the dimensions were modified to 4 in. by 1¼ in. Finally, we have now on many railways girder-section rods 4¼ in. deep, 2¼ in. wide over the flanges, and ⅞ in. thick in the web. Why were the successive modifications introduced? Obviously as the result of experience, and not of calculation, or of increased power in the engines. The sectional area at the centre of the round rod was 5.4 in.; of the first-mentioned flat rod 5.25 in.; of the second 5 in., and of the last 6.4 in. In no case would the direct stress on the rod, even assuming all the power of the engine were transmitted through it to the coupled wheels, exceed 6,000 lbs. per square inch; therefore, direct stress had nothing to do with the alterations. What happened was this—failures occurred with the round rods, and some shrewd, practical man instinctively concluded that the fracture occurred from transverse stress, and altered the section to a deep flat bar better able to resist bending. Theoretical considerations show the justice of this conclusion. At a speed of fifty miles an hour, the stress on the round coupling rods of an old-type Great Western Railway engine, the writer finds, must have been 14,500 lbs. per square inch from centrifugal force alone, or, say, 17,000 lbs., including the direct stress from the engine. This stress has since been gradually reduced, until with the most modern girder-section rods the combined stress from centrifugal force and steam pressure does not exceed half of the above, or 8,500 lbs. per square inch.

Now what is the factor of safety in the latter instance? Under direct pull the coupling rod would stand an ultimate stress of say 50,000 lbs. per square in.; under direct compression say 20,000 lbs.; and under transverse stress, which, as we have seen, is the one determining fracture, the calculated ultimate stress on the extreme fibres would be about 80,000 per square in. Is the factor of safety here $\frac{80,000}{8,500} = 9.4$, or is it $\frac{17,000}{8,500} = 2$? Experience has shown that the coupling rods are sure to fracture ultimately if the stress reaches 17,000 lbs. per square in.; and the writer's experiments, to be hereafter referred to, point to the same conclusion. By making the working stress half the breaking stress, as determined by actual practice, adequate security is found to be attained. As it is with coupling rods, so it is with other parts of machinery. A pin or some other member repeatedly fractures; it is made somewhat larger and stands.

Let us now consider for a moment another class of structure—railway bridges. The Conway tubular bridge, which has carried the heavy traffic of the London & Northwestern Railway for the past thirty-six years, is 412 ft. in span, and under its own weight the tensile stress is 13,000 lbs. per square inch. With ordinary trains the stress is 17,000 lbs., and if covered with the heaviest engines in use on the line 20,000 lbs. per square inch. The ultimate strength of the riveted structure is about 42,000 lbs. per square inch. No indications of weakness have developed during the thirty-six years' working, nor anything to suggest that the factor of safety of, say, 2 to 2½, is unduly low.

On the other hand, railway experience has amply proved that with small span, and therefore light girders, such stresses as the above would quickly lead to destruction. For that reason, in structures such as the Elevated Railway of New York, the stresses are wisely limited to 8,000 lbs. per square inch in the flanges of the girders, 7,500 lbs. in the web bracing, and 4,500 lbs. where members are subject to alternate tension and compression. Although in Great Britain the government regulations still authorize 11,200 lbs. per square inch on the net section, and in France 8,500 lbs. on the gross section, irrespective of the character of the load or the span of the girder, engineers of the present day do not act up to these regulations. In Great Britain a stress of 9,000 lbs. per square inch net section is seldom exceeded in light girders. In a recent German bridge over the Danube the permissible stresses ranged from 6,900 lbs. to 13,000 lbs.; and in a recent Hungarian bridge, over the same river, from 8,700 lbs. to 11,000 lbs. per square inch, according to the character of the loading. In one of the latest French bridges the Government authorized a stress of 11,400 lbs. per square inch gross section, in lieu of the usual 8,500 lbs., on the grounds of the dead load constituting an exceptionally large proportion of the whole. Again, the Russian Government last year issued new regulations by which the limiting stresses were fixed at 8,500 lbs. per square inch for bridges under 50 ft. span, and 10,300 lbs. for those over 100 ft. span. Thus, whether we take the case of the coupling rod of a locomotive, or the bridge over which the locomotive runs, we find that engineers have learned by experience the important truth that the strength of a structure or piece of mechanism cannot be determined by the simple process of breaking a piece of the material in a testing machine, but must be ascertained either by the gradual accumulation of the results of actual working or by testing the material under conditions as far as possible analogous to those obtaining in the case under consideration.

Wöhler's experiments on the so-termed "fatigue" of metals are well known. The writer, wishing to satisfy himself as to the behavior of modern structural steel under different stresses, has, during the past few years, carried out experiments in some respects similar to, and in others differing from, those of Wöhler's; and has also made analogous tests of hard steel and iron. The experiments may be roughly classified under four heads: (1) Rotating spindles with a weight at the free end, causing alternate tension and compression on the fibres as the spindle revolves. (2) Flat bars bent in some cases one way only, and in other cases both ways. (3) Specimens so designed as to give alternate direct tension and compression on small pieces of metal; and (4) Full-sized riveted girders.

SERIES No. 1.
Soft Steel.

No.	Revolutions.	Stress per square inch.	Factor *a*.	Factor *b*.
1	40,510	36,000	1.75	2.45
2	60,200	36,000	....	....
3	68,400	34,000	1.84	2.56
4	93,670	.....	....	....
5	107,415	.....	....	....
6	128,650	.....	....	....
7	155,295	.....	....	....
8	14,876,432	26,000	2.42	3.4
Hard Steel.				
9	5,760	67,000	1.88	2.82
10	7,560	65,000	1.93	2.90
11	14,600	53,500	2.36	3.45
12	16,300	.....	....	....
13	26,100	46,500	2.72	4.10
14	32,415	51,000	2.40	3.60
15	157,815	40,500	3.03	4.55
16	472,500	34,000	3.70	5.55
Best Bar Iron.				
17	108,160	34,000	1.70	2.38
18	110,000	35,000	1.66	2.32
19	141,750	34,000	1.70	2.38
20	389,050	32,000	1.90	2.65
21	408,000	30,200	2.00	2.80
22	421,470	32,000	1.90	2.67
23	480,810	31,000	1.95	2.75

The above series includes a representative number of the writer's experiments with rotating spindles. As a rule, the spindles were 1 in. diameter, and projected about 10 in. from the end of the revolving shaft in which they were fixed. A speed of between 50 and 60 revolutions per minute was maintained day and night. The soft steel was fine rivet steel, having a tensile strength of from 60,000 to 64,000 lbs. per square inch, and an elongation of 28 per cent. in 8 in. The hard steel was a high-class "drift" steel, having a tensile strength double the above, and an elongation of one-half the extent. The iron was the best rivet iron, having a tensile strength of from 58,000 lbs. to 61,000 lbs., and an elongation of 20 per cent. "Factor *a*" is the ultimate tensile strength per square inch of the specimen divided by the calculated stress upon the outside fibres, due to the load on the end of the projecting bar. "Factor *b*" is the ratio of the static load required to bend the bar a moderate amount beyond the elastic limit, to the load actually imposed upon the revolving bar. These definitions will be made more clear in further references to the table.

SERIES No. 2.
Soft Steel.

No. of bends.		Stress per sq. in.	Factor *a*.
24	12,240	44,000	1.59
25	12,325	—	—
26	12,410	—	—
27	18,100	42,000	1.67
28	18,140	—	—
29	72,420	36,000	1.94
30	147,390	34,500	2.03
31	262,680	34,000	2.05
32	1,183,200	27,500	2.55
33	3,145,020	34,500	2.03
Best Bar Iron.			
34	184,875	34,000	1.68
35	250,513	—	—
36	3,145,020	—	—

The above series is a selection from the writer's experiments with flat bars bent laterally. Generally the bars were

THE STRONG LOCOMOTIVE "DUPLEX"—LEHIGH VALLEY RAILROAD.

Built by MR. ALEXANDER MITCHELL, *Wilkesbarre Shops.*

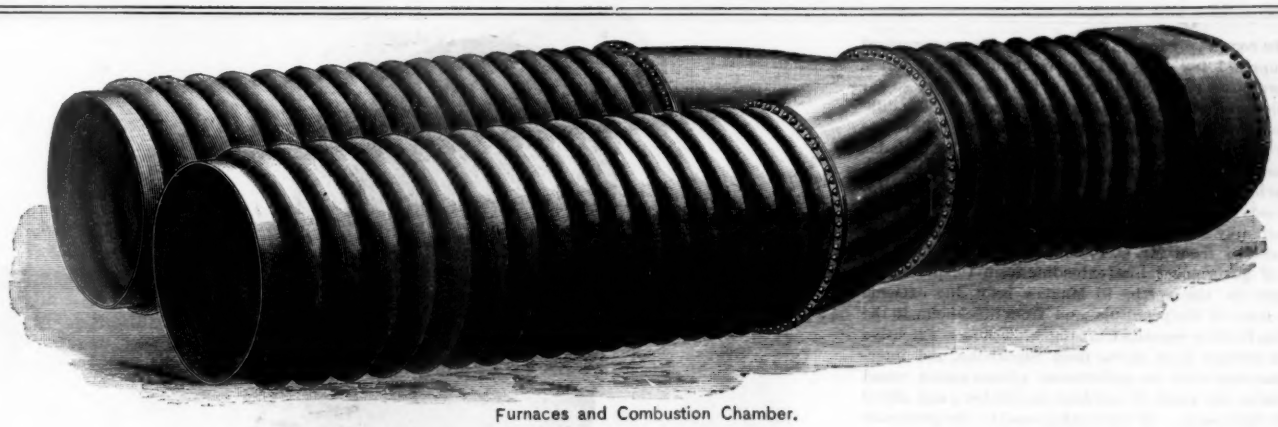
1 in. wide by ¼ in. thick, and 32 in. long between the bearings. The steel specimens were cut from the tension member plates of the Forth Bridge, and had a tensile strength of about 70,000 lbs. per square inch, and an elongation of 20 per cent. in 8 in. The iron specimens were rolled bars.

A careful consideration of the results of the preceding experiments will, the writer thinks, illustrate many points of interest to practical engineers. Experience has shown that screw shafts and axles generally, made of the finest quality of high tension steel, are not practically as strong as when made of soft steel, having theoretically, perhaps, little more than half the strength of the former. Referring to Series No. 1, we find, comparing experiments 8 and 14, that, under working stresses in each case equal to about 40 per cent. of the ultimate strength, the hard steel failed with only 32,445 revolutions, while the soft steel stood 14,876,432. Again, comparing experiments 16 and 23, it will be seen that, with practically the same number of revolutions, the hard steel, though more than double the tensile strength of the iron, broke under a working stress only 10 per cent. greater. It is impossible, in the face of results such as these, to contend that the ordinary laboratory tests of a metal give any adequate measure of its value as a material of construction.

Iron of high quality holds its own, as compared with mild steel in these experiments, and this is consistent with the general experience as to the driving axles of locomotives, which are subject to repeated bendings of considerable severity. Certain of the soft steel specimens would have given higher results had they not been turned down as fracture occasionally appeared to have been accelerated by the slight tool marking. On the other hand No. 8 did exceptionally well, although it was a turned downed specimen. All of the hard steel bars were put in with the skin on. An illusion entertained by some engineers that alternating stresses are destructive only if the stress exceeds the elastic limit is effectually disposed of by these experiments, because none of the stresses in question exceeded the said limit, and some of them were very far below it. Thus, in experiment 16, the working stress was but one-half of the stress at the elastic limit under direct tension, and only one-third of the stress at the elastic limit of the material when under transverse stress; which was really the condition of the specimen in the experiment. "Factor *b*," in the case of experiment 16, has a value of 5.55, which means that less than one-fifth of the static weight required to bend a hard steel pin a small amount will suffice to fracture the pin if the stress be alternating, as in the case of the pins of connecting rods, for example. If we take what is usually termed the breaking load, or, say in a ductile material like steel, the stress which would deflect the bar as a beam, an amount equal to half the span, then the load which ultimately broke the bar in experiment 16 was only one-seventh of the original static breaking load—a sufficiently remarkable result.

Other points of interest may be referred to in connection with Series 2. In general the bars were tested in pairs, so that when one bar broke its companion could be otherwise tested and examined. For example, the companion to No. 28, after being subjected to 18,140 bendings, was tested for tension, and failed with 48,000 lbs. per square inch, and 2.6 per cent. elongation; the original strength of the steel being 70,000 lbs. and 20 per cent. elongation. Again, the companion to No. 32 was, on close examination, found to have a flaw like those found in crank shafts. Nos. 33 and 36 were companion bars bent one way only, so that the stresses were not alternating, hence the largely increased endurance. They were both taken out before actual fracture, but with deep set flaws, clearly illustrating that the cause of failure under repeated stresses is very frequently not so much a gradual deterioration or crystallization of the metal as the establishment of small but growing flaws. This, of course, is well known to locomotive and marine engineers; and on some railways it is the custom to run crank axles until the incipient flaw is detectable, and then to hoop the webs of the cranks; whilst marine surveyors do not condemn a shaft necessarily on the first appearance of a flaw, but license it to be run for a further definite period. Another noteworthy fact illustrated by these experiments was, that a structure or piece of mechanism may be subject to a repeated stress equal to 90 per cent. of that which would break it, and yet specimens cut from the metal may exhibit no signs whatsoever of deterioration. The broken half of nearly every specimen in Series No. 2 was tested by the writer with that result. Thus, as the stress was applied at the centre of the bars, it followed that at a point 90 per cent. of the half span from the bearings, the stress would be 90 per cent. of that which broke the bar. Although the bars broke short off at the centre, at the point referred to, they could invariably be bent double without fracture. Having reference to this fact, and to the fact that the tensile strength was also little affected, it is clearly hopeless to expect to learn much from testing specimens of metal from structures or machines which have been long in use. Unless the experimenter happens to hit off the right moment immediately preceding the commencement of failure, he need not expect to learn much from the behavior of the metal in the testing machine. Professor Kennedy, in an interesting and instructive lecture recently delivered before the Royal Engineers at Chatham, has given the results of tests of 47 pieces of iron and steel, which had either been in constant use for many years until they were so much worn as to require renewal, or which had broken in actual use; but in no case did he find anything distinctly pointing to a weakening effect due to actual fatigue. This is exactly the result which the writer's experiments would have led him to anticipate; but it by no means follows that the very piece of metal tested by Professor Kennedy and found uninjured would not have broken a few days after in actual working. A man of seventy years of age may be as sound as he was at twenty; but the fifty years have told on him nevertheless, and the breakdown is certainly near and may be sudden. Having referred to Professor Kennedy's lecture it is necessary perhaps for the writer to say that he does not agree in some conclusions set forth therein. Thus, Professor Kennedy expresses his belief that the failure of coupling rods occurs as much by the gradual disintegration of the dirt between the laminations, and the oxidation of the iron, as by vibration and repetition of load; and that a homogeneous material like steel remains comparatively uninjured by repetition. This, of course, is negatived by the results of the experiments cited in the present paper. Professor Kennedy further says: "If a load exceeding the limit of elasticity be applied a considerable number of times the bar will be actually broken, but at the same time we know that if any load exceeding the limit of elasticity be but once applied the structure to which the bar belongs is distorted and rendered useless." This, the writer thinks, is a dangerous fallacy, tending to delay the application of truly scientific principles to the design of structures and mechanism.

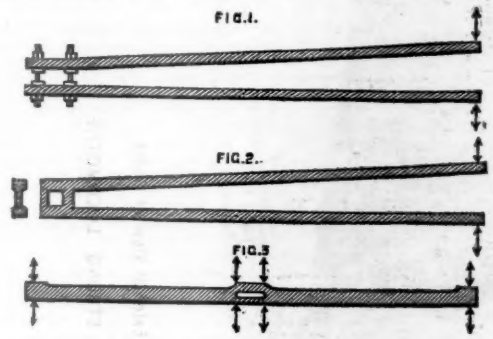
Both the bridge engineer and the mechanician must reckon with the fact that, owing to the contingencies of manufacture, parts of the metal in every structure are subject to initial stresses exceeding the elastic limit; but fortunately it is not true that the structure is thus "rendered useless." Almost every plate and angle bar of the bridge is cold straightened before going into the work, which means necessarily, an initial stress exceeding the elastic limit. Boiler shells are bent cold, and heavy initial stresses close up to the elastic limit remain permanently in operation. The writer has calculated the intensity of these stresses, and verified his results by cold straightening bars, planing away the outside skins on each side, and thus relieving the bars of one couple of initial stresses, and leaving the other couple near the neutral axis to operate. The result has been that the bars have ceased to retain their straightness, and have become curved to the extent of ¼ in. or other amount indicated by calculation. Similarly, lathesmen well know that a long shaft often wobbles when the outer skin is turned off, and many other instances will occur to practical men, proving beyond contest that, in almost every metallic structure, some parts of the metal are stressed beyond the elastic limit. The effects of repetitions of stress cannot therefore be ignored even when the nominal, or average, stress on the metal is small, because the possible heavy initial stress near the neutral axis may lead to the establishment of a growing flaw, commencing at the centre of the cross-section of the bar, and therefore undetectable. As regards riveted structures it is of course the aim of both engineer and manufacturer to insure every rivet gripping the plates with a stress fully up to the elastic limit. M. Considère, who has recently completed a most important and scientific series of experiments on riveted joints (see RAILROAD GAZETTE, Feb. 11, 1887, p. 87) sums up thus: "In all constructions in which the riveted portions have not already commenced sliding, the rivets work solely by longitudinal tension, and the adherence which this tension gives rise to between the plates in contact constitutes the sole resistance." And further: "Any alternating stress in excess of that adherence rapidly dislocates the work." The writer's experiments fully confirm these conclusions. At the Forth Bridge the rivets in the heavy bedplates are 1⅞ in. diameter and pass through 8 in. thickness of plates. Closed with hydraulic riveters of 40 tons pressure, the rivets as a rule fill the holes fairly; but care is taken that the stress is kept within the frictional adherence arising from the elastic grip of the rivets. With rivets of the same length as those in the bedplates, the average resistance to sliding was found to be equivalent to a shearing stress of 14,500 lbs. per sq. in. of rivet area; whilst the maximum shearing stress on any rivet in the bridge is limited to 11,200 lbs. per sq. inch. M. Considère found that with ordinary riveting he could reckon



Furnaces and Combustion Chamber.

THE STRONG LOCOMOTIVE.

upon an adherence of from 11,300 lbs. to 14,400 lbs. per square inch, which closely agrees with the former results. The writer, by testing plates in ordinary condition secured with bolts screwed up to a known tension, found the co-efficient of friction averaged one-third; and he also found the soft steel rivet, after being closed up under hydraulic pressure had an increased ultimate strength of 10 to 15 per cent., and an elastic limit of about 45,000 lbs. per square inch. Now 45,000 lbs. × ⅓ = 15,000, which was the ascertained resistance to sliding of the plates; and it was clearly demonstrated, therefore, that in sound work the rivets are permanently strained up to the elastic limit. This result was further confirmed by temperature experiments, measurements of contraction of rivets, and other means which need not be detailed here. In order to ascertain whether alternating stresses were as prejudical to members, such as piston-rods, subject to direct pull and thrust, as to shafts subject to transverse bending, the writer carried out a series of experiments on specimens so designed as to give alternate direct tension and compression on small pieces of metal. These specimens were of three types illustrated—not to scale—by Figs. 1, 2, and 3. In the first, the pieces of metal tested were



sometimes of round and sometimes of flat cross section, and were bolted to a couple of spring bars, as shown on the sketch; the stress being applied by opening and closing the legs of the tongs, and thus putting the metal into alternate tension and compression. In the second group the spring bars and specimens were all sawn and slotted out of one piece of steel, and the necessity of constantly tightening up the nuts was thus avoided. In the third the specimens were shaped as shown by Fig. 3, and a bending stress applied at the centre of the bars. Other experiments were made, but the above are sufficient to prove that alternating stresses are at least as prejudical when the stresses are direct as when they are indirect.

SERIES No. 3.
Soft Steel.

	No. of bends.	Stress per square inch.	Factor *a*.
Fig. 1.	28,008	37,000	1.90
	49 320	38,000	8.84
Fig. 2.	11,880	28.000	2 50
	29,568 (hard steel)	16,700	4 90
Fig. 3.	230,513	35,000	2.00
	294,735	25,000	2.80

SERIES NO. 4.

The writer has availed himself of the opportunity afforded by the large use of special plant and machinery at the Forth Bridge works to note the influence of varying stresses on full-sized riveted steel girders. These observations are still in progress and can be but very briefly referred to herein. In one instance the lever of a large plate-bending press is of box girder section, built up of eight 4 in. by 4 in. by ⅝ in. angle bars, 13 in. by ¾ in. web plates, and two 17 in. by ½ by ⅝ flanges. The span is 15 ft. 8 in., and the ordinary daily working stress on the metal is 43,000 lbs., and occasionally 57,000 lbs. per square inch. Many thousand applications of this stress have been made, and the beam has taken a permanent set of ⅛ in., but so far is otherwise intact. Observations are also being made of the behavior of sixty riveted steel box girders of 18 ft. span, built up of two 12 in. × 3 in. channels and two flange plates; which girders are subject to very many thousand repetitions of stress ranging from zero to 13 tons per square inch.

As regards the important question of the proper working stress on iron and steel, the writer's experience leads him to believe that both the old-fashioned Government regulations giving the same limiting stress for all kinds of loading, and the modern formula, based chiefly on Wöhler's experiments, fail to meet the just requirements of the practical engineer. It is in many cases a great economical advantage and convenience to have reference not merely to the variation of stress, but also to the probable number of applications. For example, the writer knows the bending press box girder lever, previously referred to, will last its time, although the working stress is about two-thirds of the ultimate strength of the material; and it would have been a mere waste of money to make it four times as strong, and so give it the factor of safety of six, usual and proper enough for a structure such as the Elevated Railway of New York, where a practical infinite number of epetitions of stress have to be provided for. Again, in many instances it is preferable to face the fact of occasional breakages than to give the strength required to insure absolute durability. Thus, in case of railway springs, a fractured leaf is a common and unimportant incident, little to be wondered at, as the working stress often ranges from 60,000 lbs. to 80,000 lbs. per square inch, on steel having in its tempered condition an ultimate tensile strength of about 160,000 lbs. per square inch. If it were as essential to guard against the failure of a spring leaf as it is to guarantee the safety of a railway bridge, it would be necessary to more than double the number of leaves in most springs.

In all works, temporary or permanent, where the stress alternates from tension to compression, large rivet area must be provided, as a very few repetitions suffice to loosen the rivets. Where metal has been subject only to compressive stresses of the varying intensity, the writer has not so far been able to detect any deterioration, and he takes account of this fact in settling the proper working stress on the struts of bridge trusses and similar works.

Twenty years ago, being uncontrolled by government regulations, the writer adopted a working stress of 16,000 lbs. per square inch on many large iron girders carrying a heavy dead load, although at that time a departure from the universal 11,200 lbs. per square inch was regarded with suspicion. The results of modern research have, however, now given the engineer a free hand, and the British 5 tons per square inch and the Continental 6 kilos. per square millimetre have ceased to be regarded with superstitious reverence. A machine or a bridge can only be well proportioned by carefully considering the special conditions of the case, in the light of experimental data and past experience. A string of formulæ will not make an engineer.

In concluding this necessarily very hurried and imperfect paper, the writer would like to bear testimony to the admirable behavior of a very good friend of his—mild steel. During the past three years he has had to deal with about 24,000 tons of that material, and to submit it in many cases to very harsh treatment. He has had more cases of so termed "mysterious fractures" with the few tons of wrought iron, used for certain temporary purposes, than with the whole 24,000 tons of steel. The rest of his experience may be of interest to brother members of this society who now are, or will doubtless be, large users of mild steel; and the testimony is perhaps of the greater value as the work at the Forth is pressed on day and night, and no precautions are taken which would not equally be necessary were the material the highest class of Lowmoor iron, costing double or treble the price of the steel.

The Strong Locomotive, "Duplex."

The accompanying views represent a locomotive which presents many novel features, some of which have been already illustrated in our columns.*

The peculiar features of the engine have been patented by Mr. Geo. S. Strong, of New York, and are to be found especially in the form of the boiler and valve gear. A pair of Fox's corrugated furnaces or flues are used side by side in lieu of the ordinary locomotive fire-box. The flues being circular and corrugated are very strong against a collapsing pressure, and require little staying. They are also free to expand and contract without throwing injurious strains on the stays or shell of the boiler.

It will be observed that the two furnaces lead into a combustion chamber, from which the ordinary locomotive tubes conduct the products of combustion to the smoke-box.

The fire-chambers or furnaces, are welded and corrugated steel cylinders, joined to the combustion chamber by a welded and corrugated steel junction piece. This piece is made originally of three plates formed on dies in a hydraulic press and then welded up and flanged out to join the ends of the fire and combustion chambers, so as not to expose a single rivet to the direct action of the fire.

The combustion chamber is also a welded and corrugated steel cylinder, flanged out to receive a full-sized tube-sheet. These internal parts are capable of standing eleven hundred (1,100) pounds per square inch, external pressure. The longitudinal seams on the outer part of the boiler are all welded, and the circular seams are double riveted. The boiler is designed for steam of 175 pounds per square inch.

The valve gear is somewhat peculiar. The motion is derived from one eccentric for each cylinder. Two eccentric rods, however, are actuated by the single eccentric. One eccentric rod is fast on the strap in the usual manner. This rod is the nearest to the spectator in the accompanying view. It is suspended by a link from a block working on a fixed quadrant. This block can be shifted by the reversing rod, but is stationary unless so moved. The position of the block on the quadrant determines the gear in which the engine is working.

The extreme end of the eccentric rod actuates a rock shaft, which in turn communicates motion to the steam valves. This motion is modified by other rock shafts placed just above the steam chest, and shown in the external elevation of the locomotive.*

The other eccentric rod works the exhaust valves and pivots on a pin in the eccentric strap. It will be observed that the fixed quadrants are carried by a large angle plate bracket secured to the driving axle box and guided by a vertical post on the frame. The quadrants therefore rise and fall with the axle.

In ordinary working the exhaust is constant, and the block is only moved on the fixed sector when reversing the engine from forward to backward gear, or vice versa.

The block connected with the rod working the steam valves is shifted along the fixed sector in order to alter the cut-off. The inventor describes the *modus operandi* as follows:

"The motion for all the valves on one side of the engine is obtained from a single eccentric, one motion of the lever attached to the eccentric moving the valves the amount of their lap and lead, while another motion produces the opening in addition to the lead.

"There are two levers worked from the same eccentric strap, one being bolted rigidly to it, while the other has a pin forged on the end of it. This pin has a bearing in a bushed hole in the strap itself, at a certain distance from their ends. Both these levers have a fulcrum pin, connected with one end of a link whose other end is hung by means of a pin from a block, capable of being moved along a sector or arc. The path of the pin, when moved along this arc, is radial to the fulcrum pin, already mentioned. Thus the position of this block or its sector, which is regulated through the medium of a reach rod, by the lever in the cab, determines the inclination of the travel of the fulcrum pin. When the block stands in the centre of the sector, as shown on the drawing, there is no inclination to the travel of the pin, and the valve is moved only the amount of lap and lead. If, however, the block is moved forward on the sector, the fulcrum pin travels over an inclined path, which incline represents the opening of the valve in addition to the lead, and the engine moves forward, and if the block is moved forward to the end of the sector, the full travel of the valve is given, and steam follows the piston 20 inches of its 24-inch stroke; if, on the other hand, the block is moved back past the centre, the path of the fulcrum pin is reversed, and the engine will run backwards. Thus it will be clearly seen, that by varying the position of the block or the sector, the travel of the valve is varied as well as the point of cut-off, which latter may be anywhere between 4 in. and 20 in.

"In all cases the exhaust valve is allowed to travel its full stroke, and as it is worked by the lever having the pin forged on its end, and from a separate fulcrum pin, with an independent link, block and sector, its travel may be varied at will, and so, of course, may the steam valve. In ordinary working, however, the exhaust block is never moved on its sector, except for reversing, when both steam and exhaust blocks are moved at the same time; after the engine is started, the steam valves are hooked up, but the exhaust is not disturbed. The steam valves are given ⅛-inch lead and the exhaust $\frac{5}{16}$-inch.

The engine has six coupled wheels, the front end being carried by a four-wheel truck, and the rear end being supported by a pair of pony wheels. The cylinders are 20 in. diameter by 24 in. stroke. The weight of the engine complete for the road is about 140,000 lbs., 90,000 lbs. of which is carried on the drivers, giving ample adhesion.

The engine was completed late in November, 1886, and has since been running on the Lehigh Valley between Whitehaven and Wilkesbarre, hauling trains over the mountain. The grades on the western slope between Glen Summit and Wilkesbarre are as high as 96 ft. per mile. The boiler was constructed at Edgemoor, but the engine was built at the Wilkesbarre shops of the Lehigh Valley under the directions of Mr. Alexander Mitchell, Superintendent of the Wilkesbarre Division.

* See the *Railroad Gazette*, February 5, 1886, and March 19, 1886, and Figs. 244 to 261 *Recent Locomotives*. The method of working the valve gear from the connecting rods as shown in these illustrations has since been abandoned, but in other respects the engine is little changed.

* The principle on which these latter rockers are constructed is somewhat peculiar, and is clearly shown in Figs. 239 to 261 *Recent Locomotives*, and in Figs. 9, 10 and 11, page 196, *Railroad Gazette*, March 19, 1886. The method of obtaining the motion from the connecting rod as shown has, however, been abandoned for the single eccentric, as shown in the present issue of the *Gazette*.

Foreign Technical Notes.

The Swedish Government appointed a commission in March, 1886, to report on the expediency of the absorption of the private railroads of Sweden by the state, the ground for so doing being a hope of improving the industrial condi-

tion of the country by lower freight rates. The government lines comprise 1,482 miles and the private lines 2,799 miles.

The committee reported in favor of the absorption, so far as it could be effected without loss to the country. The difficulties in the way of realization of the plan are believed to be too great to make it practicable, lying first in the probable resistance to the plan by the majority of the popular branch of the Parliament, and second in the improbability of obtaining the roads at a profitable rate.

A remarkably neat and artistic map of the Swedish railroads, received from Mr. C. P. Sandberg, shows a general skeleton of government lines extending from the parallel of Trondhjam on the north, to Malmoe near the extreme southern point of the peninsula, and from Stockholm to the Norwegian frontier opposite Christiania. The most extensive system of private lines starts from Stockholm, and interlacing somewhat with the government system passes round to the west of the great Wener lake to Göteborg and along the whole west coast. At the southern end of the peninsula the private lines form a very intricate net-work of partly light and partly heavy construction, and would seem to control the local business almost entirely. The remaining private lines are branches of the Government system.

New England Railroad Club.

The February meeting was held in Boston on the 9th inst., President Marden in the chair. One hundred and sixty gentlemen were present, including several prominent in railroad matters from distant parts of the country. Messrs. F. D. Adams, John Kent and W. W. Snow were appointed a committee to nominate officers of the Club for the ensuing year, to report at the next meeting.

The PRESIDENT announced for discussion the continuation of the subject which was before the Club at the last meeting, the Heating and Lighting of Cars in Passenger Service.

In answer to inquiries about an accident on the Fitchburg, he said:

Our train 33 was coming down the Ashburnham grade, and by a broken rail or axle was thrown from the track. Two sleeping cars, a Wagner and a Pullman, together with a Fitchburg coach and smoking car, went off, and struck a line of freight cars, mostly empty, standing on a side track, overturning a number of them; the Pullman sleeper was overthrown, and dragged several hundred feet on its side, and the rear truck of the second sleeper was thrown nearly under the centre of the car. The two sleepers had Baker heaters in them, and these were found intact. The Fitchburg coach and smoker were heated by a Spear hot-air heater, in the form of a coal stove, with a circulation of air around the fire-base and through the car. These stoves were not moved from their position, and although there was a good fire in all four cars, none of the stoves were broken, and no fire resulted from the accident. The hot water pipes in connection with the Baker heater in the Pullman car were broken and twisted and bent, but no one was hurt from that.

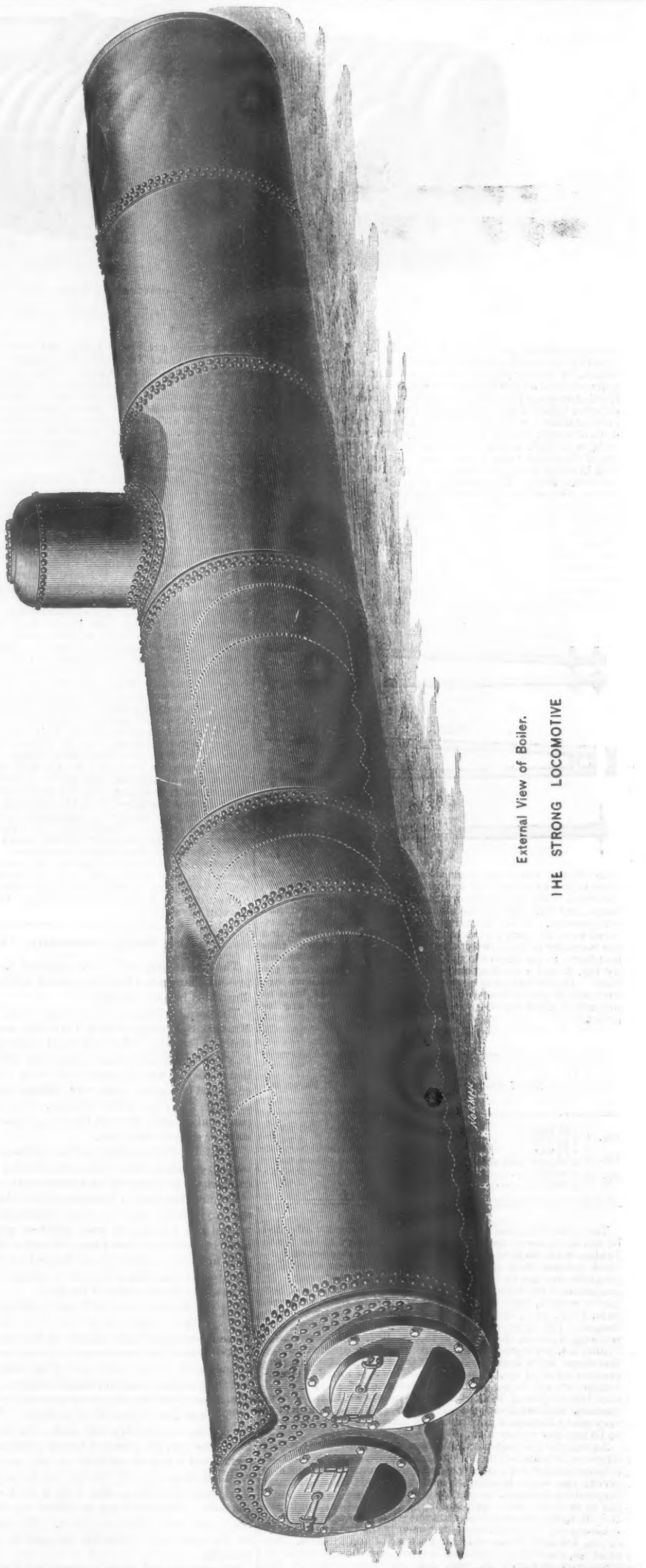
Mr. LAUDER (Old Colony): In view of the recent terrible accident on the Central Vermont, this question of heating ought to be carefully considered, and members of the Club ought to welcome anything which looks towards more safety, whatever ideas they may hold on the subject of heating. I have not changed my view expressed at the last meeting, that cars should be heated individually. I admit that it may be practicable to heat cars continuously, and possibly long trains. But if that plan is to come into use, it will be a long time yet at the best, and meantime a great many cars have got to be heated individually, and the problem is how to do that and make it safe. I think it possible to render the present hot-water heaters absolutely safe by encasing each of them in a homogeneous steel vault, so that it would be almost impossible to break the heater; but in case it should collapse or get broken, or loosed from its fastenings, the fire would be retained inside the steel vault, and it could not set the car on fire. There is nothing experimental about this; it is simply a plain box put inside the room which incloses the heater. The objection that an accident might occur when the doors of the heater or casing were opened to feed the fire, might be overcome by instructing the trainmen not to open them except when the cars are at rest.

Mr. ADAMS (Boston & Albany): As I said at the last meeting, I am thoroughly convinced that steam is the coming heat for cars, not only on account of safety, but of economy also. I think before the winter closes we shall have another train equipped with the Martin heater, the first one has been so satisfactory. I don't think we have lost a trip since we introduced this mode of heating; this cannot be said of cars heated by the Baker heater. Those heaters are frequently in the shop for repairs, and the pipes in the cars have often to be put in new, making the system expensive. Probably the coal used for each hot water heater during the season would cost $50, and this would go a good way, in the aggregate, toward fitting up stations with boilers for heating the buildings and the cars left at such stations over night, to have them ready for use. Many terminal stations are heated by steam now, and connection can easily be made with standing cars. Our engineers state that they cannot perceive any additional use of coal or any special diminution of steam, and there has been no difficulty in furnishing steam enough. The heat is equally distributed through the car, and is sufficient to enable the ventilators to be all open. When this mode of heating becomes universal, the difficulty of running cars on foreign roads will vanish, as in the case of the Westinghouse brake.

Mr. ROBERT MILLER (A. G. Supt. Mich. Central): I see many difficulties, and I hope to hear some solution of them. First, a stationary plant would have to be provided at all terminal stations to warm the cars. If the engine should fail from any cause on the road, there must be another engine somewhere on the road, with proper connections, to take its place. If a train should get stuck in a snow-bank in one of our blizzards, and the engine should fail, I don't know what you would do; you would need an auxiliary in the car. I believe with Mr. Lauder that if you can have safe individual heaters, it is the best way. I see no particular difficulty in using steam heat on trains between here and Chicago, if all the roads are equipped alike. We know that ice is produced by a chemical process; why cannot heat also be produced by chemical process for car-heating? The Johnson heater has one feature that I like, and that is a cast-iron disk, which in case of collision would break and allow the water to go on to the fire, and I believe that can be made effective. I believe there is as much danger, and perhaps more, from the lighting of cars as from the heating.

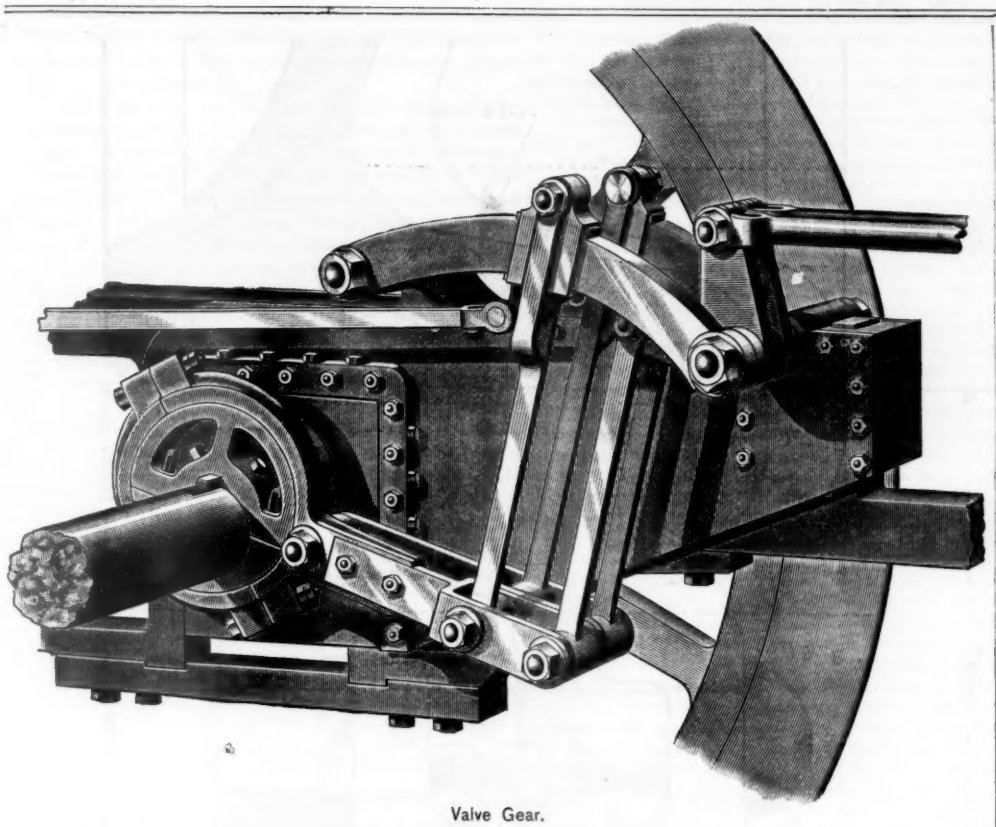
Hon. J. T. WOODWARD gave a general description of the Sewall heater, which is being tried on the Maine Central, and was followed by the inventor, who gave a more technical description, as follows:

Mr. SEWALL (Portland, Me.): The steam is taken from the engine. We find that an engine with a 16-inch cylinder and 24-inch stroke, in starting the train, will show a back pressure of about 40 pounds. The steam is worked expansively, and that pressure begins to decrease, we storing that steam in the front end of the engine, and passing it back to the train. The supply for the train is regulated by a valve, which enables the steam to be taken from the exhaust or the direct, and a uniform pressure is maintained on the pipes through the train. It is not necessary to use the exhaust; we can use only the direct, if we see fit. We need not depend wholly on the locomotive, but can take our steam from any source we wish. Taking it from the engine, it is passed to the cars by a coupling of peculiar construction, of our invention, and then passes to the central part of the car, where it is distributed through the car and regulated by a valve of peculiar construction, to meet the requirement of the car. The arrangement in one car in no way interferes with what may be required in some other car. By piping the cars along the side, in straight lines, we have done away with



External View of Boiler.

THE STRONG LOCOMOTIVE



Valve Gear.

THE STRONG LOCOMOTIVE.

the convolutions under the seats. With a temperature ranging from 40 below zero to 50 above, we can maintain the temperature in the car at 70 above. Simplicity is what we have aimed at. Our prime object was to do away with fire; next, safety; third, to make it so simple that ordinary train men can operate it. First-class engineers can't be employed in such a place, and we concentrated the whole thing into this simple device in the centre of the car, and everything is regulated by this valve, which can be managed by any one. No spring or valves are necessary in the coupling; when locked together it takes care of itself. We have had it tested with 300 pounds to the inch, and it did not leak. Suppose that a car gets uncoupled from the rest, the coupling quietly swings out of place, and every particle of steam that was in the pipes connected by it is gone. We find that in practice a hole from the boiler of the size of a small pin furnishes us with steam enough at 160 pounds pressure to heat a train of four or five cars, and the train we equipped in this way we had never been able to heat before, the cars having been built for summer business only. One way to take care of the waste steam is to let so much of it as is not condensed escape into the atmosphere at the rear end of the car; another way is to put it back into the boiler or tank. We have on the engine a vacuum pump that takes all the water of condensation back into the boiler or tank of the locomotive. For cars isolated at stations where no heating arrangements exist, we have in connection with this a device into which we put our hot water. It is a hot water well, so arranged that, allowing three or four buckets of water to fill this place, we put on at the surface of the water an automatic trap that keeps it at a uniform height, and it is ready for work if we have occasion to use it, with a coal grate arrangement for firing instantly, and in case of accident, or if for any other reason the source of the steam is cut off, we can resort to this, and also for heating at stations without the engine. We use 1¼ and 1½ inch pipes. We have heated five cars coupled together. (The coupling was shown by Mr. Sewall, and its action explained. While remaining in a horizontal position, it will be intact, and will stand any amount of shaking; but if the rubber pipes are pushed together so that the coupling is raised up perpendicularly, it instantly separates, and the connection is broken.)

We have used on the engine this winter a ⅛ inch valve. It takes ten turns to open this valve and give it its full capacity. The engineer has used ⅛ to ¼ of one turn—which I understand reduces it down to about $\frac{1}{320}$ of an inch. He has never been able to discover that any power was taken.

The PRESIDENT: If cars of the Boston & Albany road, equipped with the Martin system, were taken on to a road equipped with your system, could the cars be all run together?

Mr. SEWALL: No, sir; on account of the difference in the couplings, first; then, in the pressure; and also in the number of valves that have to be manipulated separately. We have only one in the centre of the car, flush with the floor, and only one man is required to manage it, to shut off or let on the steam, which he does with a quarter of a turn, one way or the other, at one point. The auxiliary boiler can be isolated from the rest of the apparatus.

Mr. MILLER: Could you utilize the pipes now in the Baker or Johnson heater in connection with your apparatus?

Mr. SEWALL: We can do so, but I would not advise it. There is no corrosion in our pipes, as there is in pipes where salt water is used, and those pipes give out occasionally. There is very little water in our pipes; we get only a bucketful to a car in running 100 miles. When the steam is let on, it will go through the pipes as fast as a man will walk; and in cold weather it will take from half to three-quarters of an hour to get the temperature of the car up to 50 or 60 degrees. I have taken a car that has stood out doors, with the temperature at 14 below zero, and filled the auxiliary boiler or well under the car with cold water, and with this alone raised the temperature in the car to 65 above, within an hour after starting the fire. The fire is made from the outside. This is to be used only in cases of emergency, when we do not have steam from the engine. After the cars have been run a trip, heated from the engine, when the engine is detached they will retain heat enough to keep them comfortable for three or four hours, if at rest.

Mr. A. GRIGGS (Providence & Worcester): We have used steam heat on our road for about three years, with four different heaters—the Chilson, Spear, Standard and Westinghouse. We should have no trouble in heating our cars with steam from the engine, because we make no connections with any other road. Most of our stations are heated by steam, and there would be no difficulty in heating cars remaining at them over night.

Mr. JOHNSON referred to the good record of his heater in keeping cars warm while blockaded by snow 4 days in Kansas.

Mr. OWEN, of Detroit: We have been in the car heating business a number of years. Our heater is used on many of the leading roads of the West. It has also been put into nearly all the official cars of the N. Y. Central. It consists of a boiler made of ¼ inch homogeneous steel, with a water space of 1¼ inch around it, running clear to the floor, to which the boiler is securely fastened. The doors to the fire-box and the ash-box are provided with a sliding steel sheet, which securely protects them, and they are automatically locked. The whole apparatus is encased also in an iron casing. The fire is encased within this boiler. It is so strong it would not be broken by any collision. It is only 15 in. diameter outside, and 42 in. high, and will carry 602 feet of pipe.

Mr. MILLER: Mr. Sewall has answered some of my objections to steam heating. I will ask, in case of derailment of the engine, where another engine could not be supplied, if a fire could be lighted in the auxilliary to keep the cars warm for an indefinite length of time?

Mr. SEWALL: Yes, sir.

Mr. MILLER: Would the water in that well be sufficient to keep up the circulation of steam and keep the cars warm all night, if detached from the engine?

Mr. SEWALL: Yes, sir. Any kind of fuel can be used in this auxiliary. The well is made of flange steel, and it is so suspended that in case of accident you would always find the heater with the trucks.

Mr. ADAMS: It seems to me that we ought to be convinced that steam heat for cars is practicable, from the representations that have been made here to-night, even after allowing a reasonable margin, as we always should when new things are presented; and I feel more convinced than ever that steam is to be the coming heat.

Mr. GOLD, in answer to questions, said: My heater is similar in many respects to others, except in this one respect of storing the heat, which is necessary at times, when the engine is detached. My system is used on the elevated roads in New York, on the Long Island, the Staten Island, the Providence, Warren & Bristol and the Westchester suburban road (New York), 900 cars in all. The storing consists simply in placing one pipe inside another; the outer pipe four inches in diameter, the inner pipe three and a half; the latter nearly full of salt water. These are placed on the side of the car. When the steam is turned on, it stores the heat in the water and heats the cars simultaneously. As soon as the steam passes through the storage cylinder, which requires about two minutes, the water is boiling hot in the inner pipe. That is sufficient to heat the car for about two hours. The Hoboken Elevated cars are heated by a stationary boiler, and the steam is turned on once in every two hours for about three minutes. We use a lock coupling, similar to that in the Westinghouse air brake, and rubber hose between the cars. If we have a stationary boiler at a station we can get heat enough to run 100 miles and not draw on the engine at all. It requires very little steam to reheat it. In going down a grade, if you have extra steam, that can be turned on, and the blowing-off steam can be utilized. We can shut off the heat on one side of the car, and heating one side is ordinarily sufficient. We can heat ten cars at once. The engineer on the Staten Island road says, with seven cars, he perceives no difference in the amount of steam used. The condensation is about 20 pounds per hour per car. The system has been in use about four years, and has been thoroughly tested. Cars can be kept warm five to seven hours after being detached.

Mr. GOLD (replying to Mr. Lauder): We can easily heat 12 cars, if necessary.

Mr. PECK: We have a simple device, a casing designed to cover any heater or fire-box, for safety. It works automatically, and was invented by Mr. Stevens. You will see by this model (model placed upon the table) that it is simply a casing made of boiler iron, with a head of the same material at each end, and may be cylindrical or of any other shape, and is strong enough to resist great pressure from without. There is no cast iron about it. It has apertures above and below for the hot air to escape and the cold air to come in, and these open and close by the same automatic action. If the stove should be broken, the fire would be imprisoned in this case.

Mr. BAKER (of the Baker heater), having been called upon by the President, alluded to the fact that experiments in heating from locomotive had been made several years ago, and believed the system would be expensive and constantly beset with difficulties.

The PRESIDENT read a communication upon the McLeod system of heating cars by hot air, heated by the fire-box of the locomotive and distributed through the cars by pipes, and it was explained by Mr. McLeod. It has not yet come into use.

It was voted that the discussion on Lighting and Ventilating be postponed to the next meeting. The annual election of officers will also take place at that meeting. Adjourned.

Western Railway Club.

The regular monthly meeting of the Western Railway Club was held in Chicago on Wednesday evening, Feb. 16, President Scott in the chair. Mr. G. W. RHODES (C. B. & Q.) wished to have the proceedings of the Brake Test Committee at Pittsburgh put on the record, and gave the information reported by the *Railroad Gazette* in its last issue.

President SCOTT suggested Car Heating as a subject.

Mr. ALLEN COOKE had no new method to recommend, but felt that it is the duty of the Club to recommend something better than stoves in response to public demand.

The SECRETARY read letters from the Gold Co., of New York, and the Emerson, of Springfield, Mass., outlining their systems.

Mr. BARR was trying two systems, the Martin and Westinghouse, having already fitted up a train with the former. Neither had been used yet sufficiently to decide on their merits.

Mr. MARTIN gave by request a description of his system as described in the *Railroad Gazette*. He had had it running three winters, and had never taken out a single pipe on account of damage. He will put in his system and make no claim for pay if it is not as represented.

If cars are left at way stations they must have means of supplying steam, and if stuck in snow drifts this emergency must be provided for. The cars on the Chicago, Milwaukee & St. Paul road are using 8½ gallons water per car hourly.

Mr. SCOTT understood that a boiler must be kept at points where cars are left off.

Mr. RHODES: Similar problems that have come up for solution that seemed as difficult as this; when electric lighting was introduced the impression was that gas would be dispensed with. In practice both are used, one to help the other. Something similar will probably happen with our heating. Fire in the locomotive rarely causes fire in wrecks, because it is properly protected. Stoves could be made equally safe.

Mr. MEAD: Any system that can be devised will have drawbacks; experience and ingenuity will overcome them. Stoves and steam should be used in combination.

Mr. TOWNSEND perceived danger of explosions from use of steam.

Mr. BARR: The pressure used is so light that there is no danger of explosion.

Mr. MEAD asked if reducing valves act automatically.

Mr. MARTIN answered that they did.

Mr. SINCLAIR: I see no danger from explosion with steam apart from water. The quantity of compressed steam in the pipes could not scald when passed into the large car area. Public sentiment is saying stoves must go, and it is railroad men's business to find safer methods. There is no department of railroad work where less improvements have been made.

Mr. FORSYTH: According to reports, 12 cars can be heated with steam representing 20 horse-power. Most locomotives could spare this. We are using the new Baker heater satisfactorily. I think it possesses an important advantage in being away from the end of the car; it is not so liable to get smashed. We are also trying a heater similar to the Westinghouse, and are watching to find something perfectly safe.

Mr. SCHLACK: I do not see how we could apply the Martin system to suburban trains; cars are changed at too many places.

Mr. QUAYLE: It is the business of railroad men to overcome difficulties connected with the details of the new system. Stoves must be abolished; steam or something else will prove superior.

Mr. KIRBY: This subject has changed wonderfully in four weeks. I have just given an order to equip a suburban train with the Martin heater. There is no difficulty in railroading so hard but the ingenuity of Yankee minds will overcome it.

Mr. PULLMAN: The Rock Island road is using 100 Baker heaters and is now applying the Westinghouse heater to some cars.

Mr. SCOTT: The stove must go, for the public has condemned it. I do not believe in halfway measures, let us dispense with stoves entirely.

The discussion was closed at this point, and after taking up the interchange rules and recommending a few minor changes, the meeting anjourned.

New Car Works for Baltimore.

For some months past a number of leading capitalists of Baltimore have been working up a company to establish extensive car works there. Their plans have now been matured, and arrangements are being made for the construction of a number of buildings at Curtis Bay. The incorporators are Messrs. Robert Garrett, William Keyser, D. L. Bartlett, Benjamin F. DeFord and Clinton P. Paine. The capital of the company is $200,000, all of which has been subscribed by Baltimore business men. The presidency of the company, it is said, has been accepted by Mr. William Keyser.

The shops will be erected close to the present pier of the Baltimore & Ohio Railroad at Curtis bay. Seven large and many small buildings will be put up along the water front, and bids for their construction will be very shortly asked for, so that work can be commenced on them as soon as the weather is favorable.

Flange Worn Rail.

The flange worn rail, shown herewith, is one which has been in a 14° curve on the main line of the Lehigh Valley at Mauch Chunk from June, 1884, to June, 1886, the traffic all being one way on a descending grade of 12 feet per mile. The shaded portions of the rail and wheel show the section of the rail when removed and its relation to the wheel, while the original section of the two is shown by the other full lines higher up. The flow of the metal under the wheel tread is quite conspicuous, as is also the remodeling of the railhead to the shape of the worn wheels, as shown by its failure to touch the outer portion of the standard wheel tread, the entire bearing of which is only about three-quarters of an inch in width immediately over the axis of the rail.

The excellent form of the Lehigh Valley section for angle-bar splicing is clearly brought out in the cut. The spread of the head at its base gives a large bearing on the splice, and permits the development of an upper flange to the angle splice. The roadmaster of that road writes, Dec. 16, 1886: "Hardly any of our splices* break until they have been in use at least 5 years. Very few of our 66 lb.† splices have thus far broken, even when they have been in use 10 years. With one exception none of our 67 lb. splices have thus far broken. None of our 76 lb. splices, either iron or steel, have broken or failed." The Lehigh Valley adopted the 76 lb. pattern early in 1884.

Mr. Robt. H. Sayre the Second Vice-President of the Lehigh Valley, in a letter to us says: "Our heavy coal and freight trains slow down as they pass the station, and the result is that almost invariably the car buffers, which are double—one on each side of the draw-hook—are together; that is those next the inside rail.

The tendency of the cars, which are mostly four wheel, to run tangential to the curve, is very much increased and the wear augmented by the push of the following cars against the inside buffer, at least such is my theory, and in support of it I may state that the outside rail of the up track, when the train is stretched out, each car is pulled away from the outer rail and there is no appreciable flange wear.

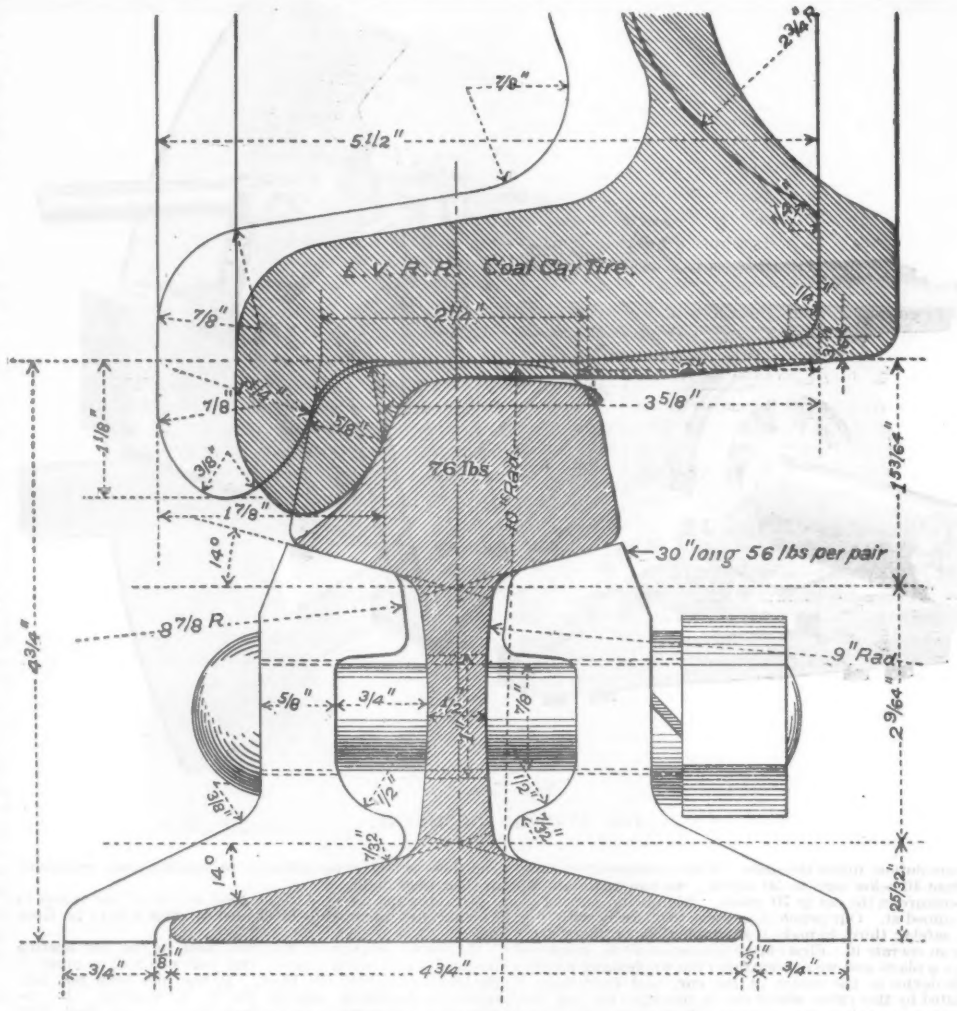
Analysis of this rail shows carbon 0.42.

When this curve was relaid last year it was with harder rails and up to this time the wear is quite insignificant.

The rails now in the curve were made by the Bethlehem Iron Company of different degrees of hardness, as follows:

No. 1	0.66 Carbon.
No. 2	0.57 "
No. 3	0.49 "

I am watching the wear of these rails with much interest.



FLANGE WORN RAIL—LEHIGH VALLEY RAILROAD.

* Including old pattern of splice on 4 in. rail.
† Weight of rail.

Contributions.

Remarkable Switching Operation.

TOLEDO, Ohio, Feb. 9, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The following "Freak of Wheels" may be of interest. I offer no theory or explanation, but simply say it actually occurred. Yours truly, BUXTON.

At Fostoria, O., is a grade crossing of the Toledo & Ohio Central and Columbus, Hocking Valley & Toledo Rys. The first is tangent and the second a 2° curve. Angle at the intersection of the centre lines 7° 37½′. A passenger train on the Toledo & Ohio Central track, consisting of engine, combination baggage and smoker and one passenger coach, instead of keeping its own track took the other track, and the entire train went over without displacing a wheel. Once on the Columbus, Hocking Valley & Toledo track it refused to go back the way it came and had to be run half a mile or more to transfer.

Canal Influence on the Railroads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Notwithstanding the first Vanderbilt's advice to William as to the locality on which he fought his cock, I beg leave to call your attention to the statement, "So far from the canal regulating the rates of the railroads, it is the railroads and their attitude towards one another which decides the amount of traffic that may no by canal," contained in your esteemed editorial, "Railroad Competition and New York Trade," and suggest that the half truth there enunciated should have been qualified by the statement, that in times of reckless railroad warfare, a disastrous disregard for the interests of the stockholders, an insane desire to carry freight at a loss, may so reduce the *price* of railroad transportation as to diminish the amount of freight carried by persons who would, if entering into the competition, fight with their own money.

If you will refer to the table in your issue of Jan. 9, 1885, showing the Chicago-New York grain rates for 20 years, you will notice that in 1876 the *published* rate from May 5 to December 18 was 20 cents, a lower rate than ever before, and the percentage of receipts by canal dropped from 21.1 in 1875 to 15.6 in 1876. The next year the lowest rate was 30 cents, and the canal carried 23 per cent. In 1878, from May 17 to Aug. 5, the rate was again 20 cents and the canal carried 21.76 per cent. In 1879 the published rate was as low as 10 cents in May, but reached 35 cents before the close of navigation, and 17.15 per cent. of the freight went to the canal. In 1880 the rate did not fall below 30 cents and the canal carried 20.3 per cent. and so on till last year, when under fair rates the canal shows a large gain in traffic.

No one, it is thought, can hold that one or even two mills per ton mile is a fair compensation to the owners of the property interested, unless other objects than the present earnings are in view, and as the rates to Baltimore, Philadelphia and New York were in question, the losses may have paid—the party gaining; but the circumstances were no more normal than when tickets are sold to Chicago for $5, and it seems as if attention should have been called to the environing circumstances when making an unfavorable generalization against even so inadequate a water way as the Erie canal.

You cannot, Mr. Editor, be ignorant of the influence ascribed to the canal by Mr. Fink when before the "Hepburn Committee." It extends to every point of the country." "Thus the lake and canal navigation regulates the rate of the whole country, you may say, from Canada down to the Gulf. The maintenance of our trunk canals (and he might well have said their improvements) should engage the constant solicitude of the state.[!] Nothing could be more prejudicial to the interests of the city of New York or the state as a whole than to permit their efficiency to be impaired or their usefulness to be compromised. Mr. Blanchard asserted before the Interstate Commerce Committee of the Senate that, waterways are the safeguards against railroad extortion; that railroads can reduce their freight rates below paying rates on the canal, and thus secures the traffic, will be readily granted, but it is not understood that they can raise their rates with the same effect. CANALLER.

That "Stop Block."

MERIDIAN, Miss., Feb. 11, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to "J. S. W.'s" rather facetious remarks in your issue of Jan. 28 regarding the "stop block" illustrated in the *Gazette* for Jan. 14, I claim that his supposed objection is really a point in favor of this device, for the following reason: As engineers work directly under the supervision of the Division Master Mechanic, who also generally superintends the repairing of trucks, it stands to reason that all damage done by this stop block has to be repaired by the D. M. M., and is consequently brought to his notice. There is no necessity for an engineer (except under occasional unavoidable circumstances) entering a spur track with force enough to knock a truck from under a car; for a force that will do this will undoubtedly break several draw heads, and perhaps knock the old style "butting post" into splinters. So let an engineer knock a few trucks from under cars and get "laid off" some fifteen or thirty days for it, and he will in future be very careful how he approaches the end of a spur track; whereas, if he were simply to knock into a "cocked hat" a butting post, which would have to be repaired by the track force or rebuilt by the carpenters, the D. M. M. would probably never learn of it, and the engineer would be free to repeat the exploit whenever he felt like it. This may not strike engineers very favorably, but it is the truth all the same, and a person does not have to be railroading very long before he finds out that a man in one department will not take the same care of property that is kept in repair by another department that he would of property maintained by the department under which he serves. On this hypothesis was the "stop block" referred to adopted on the C., N., O. & T. P. system, and its constant use for a number of years has demonstrated beyond a doubt the truth of my remarks. J. N. HUSTON.

The Tractive Power of Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your interesting review of the performance of the Norris Locomotive (*Railroad Gazette*, Feb. 4), you assume that the indicated pressure in the cylinders is 83⅓ per cent. of the boiler pressure, and that the tractive force indicated in cylinders is all transmitted to the draw-bar. Are not both these assumptions rather more favorable than would be warranted by practical experience?

As to the first point, considerable data exists for its determination; and it seems doubtful whether more than 75 per cent. of the boiler pressure is realized as pressure on the pistons, unless the conditions are exceptional.

The ratio of effective tractive force (on draw-bar) to tractive force indicated in the cylinders of a locomotive is certainly less than unity, if it be conceded that there is any engine-friction. Experimental data relating to this ratio are not very abundant, but there seems to be a popular belief that the friction of locomotive engines is much greater than the friction of land and marine engines. Some experiments made by Mr. Regray, in France, with a dynamometer-car fitted for taking indicator-diagrams by electricity,—so that observations of tractive force in cylinders and tractive force on draw-bars could be made simultaneously,—gave the following results (see *Engineering*, XXXII., 287):

Average Ratio of pull on draw bar to indicated tractive force.

	Observed.	Force required to move locomotive deducted.
Express locomotive No. 502	0.425	0.342
" " " 503	0.416	0.356

RICHARD H. BUEL.

NEW YORK, Feb. 7, 1887.

[Our correspondent is in error in stating that we assumed that the whole indicated tractive force of the Norris or any other locomotive was transmitted to the draw-bar. It is, of course, used to overcome the resistance of both engine and train. The internal friction of the engine and tender was found by D. K. Clark to be 12 lbs. per gross ton of their weight. The same authority also found that the resistance of English passenger cars of that date (1847) was about 6 lbs. per ton. Assuming that the cars weighed twice as much as the engine and tender, the friction of the whole train would amount to 8 lbs. per ton. It is, however, very doubtful if Clark's formula is applicable to modern trains and rolling stock.

In the case of the Norris engine, however, nearly the whole tractive force of the engine was exerted in overcoming the force of gravity due to the very steep incline, and the frictional resistance of the engine or train had very little influence. A little reflection will show Mr. Buel that a large amount of the tractive

force of the Norris engine was absorbed in overcoming its own gravity, and was consequently not transmitted to the draw-bar at all.

Some careful experiments on the resistance of modern American locomotives and cars are now being made by Mr. Godfrey W. Rhodes, on the Chicago, Burlington & Quincy, and others will shortly be made on the Pennsylvania by means of a very carefully and accurately constructed dynamometer car. It is, however, extremely difficult to obtain accurate results in these tests. The cars employed at the Burlington brake tests showed resistances varying from 4 to nearly 10 lbs. per ton at speeds under 15 miles per hour. It is, of course, difficult to arrive at an average under such circumstances.—EDITOR RAILROAD GAZETTE.]

Rapid Transit in New York.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is evident that better facilities for communication are needed between the upper and lower portions of New York island, and also between lower New York and the suburbs, particularly those north of the Harlem and on the west side of the Hudson.

In the latter case, there is the daily loss of time in passing the river accompanied by a disagreeable change from cars to boat or from boat to cars according to the direction of travel, besides the occasional long delays from fog and ice in crossing the river.

It has been proposed to remedy this by completing the Hudson River tunnel, bringing passengers directly into the city, but I do not remember seeing any formulation of a scheme for a terminal on the New York side by the tunnel projectors. This would undoubtedly be a very costly one and it would seem to involve almost of necessity a considerable extension of the tunnel.

The objection to this, apart from the expense, would be the fact of the long tunnel transit. Now, although a tunnel can be made an endurable evil, by perfected ventilation and well lighted cars, still I think few persons would not consider it an objection in itself as compared with a transit over water with fresh air and a harbor view. I can myself testify that the Bergen tunnel is a daily trial, astonishing in amount considering the shortness of its duration. The passengers on the rapid transit local trains from the Grand Central station would be strong witnesses to the unpleasantness of tunnel transits.

The other difficulty—deficient rapid transit facilities in New York—would be liable to the same objections if carried out on an underground plan, and as to occupying another street of those available overhead, what influence can be strong enough to get a charter for such a scheme.

Out of this dilemma I think there is an escape, which would successfully solve the problem. Let a company buy a right of way for a four track road through the heart of the city as near Broadway on the east as practicable, carrying the line as near to the east of Central Park as possible and crossing at the upper end of the Park to the ridge running west of Tenth avenue and across the Harlem to connect with suburban lines. From this line a branch across the Hudson just above 110th street would find a crossing less than a mile in length from bluff to bluff at any desirable height. With a bridge so located probably all the roads west of the river could be easily connected, and those north of the Pennsylvania would probably find it advantageous to run their passenger trains into the city and down to the Battery over such a road. The distance to the Battery by it from the crossing of the Erie and the Lackawanna would be about fifteen miles. With six stops on Manhattan Island, this distance could be made in 38 minutes, which is about as short a time as is now taken to points on Broadway below Chambers street by the average commuter.

I would put the grade of such a road at the top of a six-story building on an average; rebuild all buildings which could not be altered to suit the supports for the railroad; and utilize them for business purposes. At the stations powerful lifts should be provided, capable of taking 100 people 80 ft. vertically in one minute, like those at the Mersey tunnel between Liverpool and Birkenhead. These could be operated very economically on the water-counterbalance plan, in which only as much water is used as is needed to produce the motion, the weight of the lifts themselves counterbalancing each other.

The cost of the whole construction per mile, including ample station accommodations, may be set at $1,137,135, or 25 per cent. more than the inner circle of the London Underground. I exclude the cost of right of way, as 5 per cent. could undoubtedly be got on this from the buildings to be put up under the road whose cost is included in the above statement. The total cost for the 14 miles to the Harlem River, with the branch to the bridge proposed below, and with bridge over the Harlem, would then be $15,919,890. The proposed bridge over the Hudson might be made either in several spans or in one suspension span, 3,700 ft. from 10 ft. of water on one side, to 10 ft. on the other. The great weight of material in such a span, and the consequent small influence of moving loads, would make it eminently suitable for railroad use, a little counterbracing would be required to prevent excessive deflection under a train. The experience with the short span of 821 ft. at Niagara has shown how much more satisfactory in operation the span proposed would be. But I hear some one say, where would you get your interest on the enormous capital required? Let us see. The cost of the railroad on the New York side may be set down, as above figured, at $16,000,000. The cost of the bridge we can deduce from comparison with the nearest existing approaches to it in size. The Brooklyn Bridge cost $15,211,982.92, or $2,540 per lin. ft. The great truss cantilever bridge over the Forth, 1½ miles long, with 2 spans of 1,730 feet each, has been contracted for at $8,000,000, or about $1,010 per lin. ft.

If the abutments of the proposed bridge were placed in shallow water and founded almost immediately below the bottom on solid rock, a very great portion of the expense of the Brooklyn Bridge would be avoided. The heavy cost for right of way for the approaches, amounting to nearly $4,000,000, and the great blocks of masonry in anchorages would be avoided; and altogether, I think, it would be safe to say that the expense per lineal foot of the whole bridge and approaches need not be more than 10 per cent. more than that of the Brooklyn Bridge. The total cost would then be 4,700 ft. at $2,794, or a total of $13,131,800. The railroads on the west side might be safely left to provide approaches there. The total expense of the proposed elevated road and the bridge would then be $28,051,690.

As to traffic, there are at least 3 million passengers yearly in both directions coming to New York from points beyond Jersey City who would use this bridge. In these I include only the Erie and the roads coming to the river at its station or at points north of it. The passenger traffic in the city itself can be safely estimated at one-fourth of the present business of the collective roads, or 29 million fares per year from this source.

The collective passenger business would then amount to over 32 million fares a year, at five cents or over, $1,600,000. Allowing the working expenses to be 53 per cent. of the gross earnings, as on the Manhattan Elevated, we have net earnings of $752,000, or 2.69 per cent. on the investment. This is what might be called the revenue in sight. In addition to this there are the following elements which may be expected to form immediately a very large element in the revenue and in a very short time will more than double it without the expenditure of a dollar more for structures. First, the freight traffic which will pass across the bridge en route to New England and into New York, as the proposed road could be made for the above figures capable of transporting of freight and provided with suitable facilities for discharging it into storehouses under its own lines.

Second, A large business along the west side of the island which now falls to the Tenth avenue cable road and to the west side branch of the New York Central & Hudson River.

Third, The suburban traffic above the Harlem which now goes either to the Central or *via* the New York City & Northern to the Manhattan Elevated.

Fourth, The probability that such a line would draw to itself considerably more than the fourth I have given it by reason of the rapid transit afforded and the convenience of access by lifts instead of by stairs as in the existing roads.

The second and third elements named may be expected to develop enormously within a short time, as the districts they take in are exceedingly attractive and would be placed by the proposed scheme within fifteen to twenty-five minutes of Wall street.

Eventually a connection would be made over Blackwell's with the Long Island Railroad and the large residence district of Williamsburg, etc., feeding the proposed line.

In conclusion it may be observed that the figures I have given for cost will probably be criticised more for their extravagance than for any other reason, as the cost of the inner circle underground London, to which I have added 25 per cent., included right of way and enormous expense in shoring up heavy buildings. The cost of the bridge, too, in view of the fact that almost no right of way would be required, must be considered excessive. If it seemed best to build a connecting line on the west, it could be done at no excessive expense and the traffic over it could be pro rated from the companies using it at prices which would make it pay well.

ENGINEER.

TECHNICAL.

Locomotive Building.

Contracts for 50 locomotives are soon to be let by Messrs. Brown, Howard & Co., New York, contractors for the Duluth, South Shore & Atlantic Railway.

The Car Shops.

The Wells & French Co., of Chicago, have secured the contract for 700 freight cars for the Minneapolis & Pacific.

The Wason Car & Foundry Co., Chattanooga, Tenn., is at work on some flat cars for the Covington & Macon.

The Wason Manufacturing Co., Springfield, Mass., is building 13 passenger coaches for the Old Colony, 15 for the Boston & Maine, and four drawing-room cars for the Boston & Albany road.

The Michigan Car Co., in Detroit, Mich., has taken an order for 500 box-cars for the Grand Rapids & Indiana road. The same company is building some Wick's refrigerator cars for the Royal Danish railroads. The cars are being built in sections, and will be taken apart when completed and shipped to Denmark.

Bridge Notes.

The Mt. Vernon Bridge Co., Mt. Vernon, O., has the contract for the bridge to be built over the Cumberland River at Nashville, Tenn.

Manufacturing and Business.

The Dunham Manufacturing Co. has orders for its car door hanger as follows: 100 for Boston & Albany; 600 for New York Central & Hudson River; 400 for Mexican Central; 200 for Lehigh Valley; and also for the Delaware & Hudson Canal Co., the Chicago & Grand Trunk, and the Detroit, Grand Haven & Milwaukee.

Iron and Steel.

The E. & G. Brooke Iron Co., at Birdsboro, Pa., have added a new 3-high 24-in. sheet mill to their plant.

The Thomas Furnace Co., of Niles, Ohio, have increased the wages of their employés 10 per cent.

It is stated that the Bethlehem Steel Co., of Bethlehem, Pa., have a fleet of seven chartered ships continually engaged in transporting manganese from the mines in Cuba, and are now building two more new iron steamers in Philadelphia for the same trade.

The firm of A. Garrison & Co., of Pittsburgh, Pa., has been reorganized under the style of the A. Garrison Foundry Co., with a capital stock of $650,000.

The Bertha Zinc, Coal & Iron Co., Saltville, Va., has been organized. Capital $3,000,000.

The North Branch Steel Co., of Danville, Pa., have contracted with J. P. Witherow, of Pittsburgh, for the erection of a steel works with a capacity of 300 or 400 tons a day. It will consist of two 4-ton Bessemer converters with a large blooming mill, soaking pits and shears for the largest-sized blooms and slabs. The product will be manufactured into street rails, for which the company already have orders to run the mill eight or ten months.—*Iron Age*.

Great Tunneling Record.

The fastest work of driving yet accomplished on the new Croton Aqueduct tunnel, and in fact anywhere, referred to in our last issue, has been done at shaft 15, on Messrs. O'Brien & Clark's contract. The full particulars are as follows:

Size of heading driven	8 ft by 16 ft; 3⅛ to 3¾ yds. to the foot
Distance driven in both headings	614 ft.
" " north heading	288 ft.
" " south "	326 ft.
No. of shifts worked in north heading	49
" " " south "	50
" shots fired in north heading	46
" " " south heading	49
" rock-drills used in north heading	2 No. 13 Rand Sluggers
" " " south heading	3 " "
" days worked in north heading	24½
" " " south heading	25
" feet driven per day in north heading	11 7
" " " south heading	13.0
" muckers employed in each shift	8

The largest weekly run was made at the south heading from the 22d to the 29th of January, 12 shifts (no Sunday work), when 90 ft. were driven in this time. The rock is a hard gneiss. For a distance of 15 ft., a seam of quartz was struck, which dulled the steels rapidly and caused considerable delay. The explosive used was mostly the rackarock powder, made by the Rendrock Powder Company, save a few shots, where dynamite was put in the centre cut only. This work stands as the best on record. The greatest progress made in the South Pennsylvania tunnels was 84 ft. a week. At the Sutro Tunnel, where some fast work was done, the highest record was 10.3 ft. a day, against a monthly average of 13 ft. a day here. The shaft is under the immediate supervision of Mr. William M. Hall, engineer for Messrs. O'Brien & Clark. The foreman is Mr. John Barron. The heading bosses under him were John Stevens and J. Shephard at the north and Patrick Haley and William Johns at the south heading. It is worthy of particular note that the Slugger drills that made this great record have been in use for nearly two years, thus showing a wonderful durability. Another big month's work was done at shaft 19, north, under Messrs. Paige, Carey & Co., where 309 feet of heading were finished during the month of January, 30 working days, 13 shifts a week. The section here runs about 5¼ cubic yards to the foot. The foreman is Mr. William Hollister, and his heading bosses are William Aldron and M. Burran. The drilling was done with four No. 13 Slugger Rand drills.—*Engineering and Mining Journal*.

Consolidation Engine on the Boston & Albany.

The Boston & Albany are trying a Baldwin consolidation engine on their line between Springfield and Worcester. This line have for many years employed chiefly American type engines (four wheels coupled), experiments made with moguls made some fifteen years since, not being considered to give good results. The consolidation hauls 35 cars up the grade between Springfield and Worcester, whereas the ordinary engines only haul 25 cars.

The French Railway Jubilee.

The promoters of the French Railway Jubilee, which is to be held in Paris this year, have received a severe check, which is not altogether unwarranted. The six largest railway companies of France have declined to associate themselves with the undertaking, as contrary to historical accuracy and as prejudicial to the interests of the exhibition for the centenary of 1789. Firstly, they remark, the inauguration of railways in France is to be traced to a date anterior to 1837, and to celebrate in 1887 the jubilee of French railways would lead to a conclusion contrary to facts, that France had allowed itself to be outstripped by other nations. Secondly, to organize an exhibition specially for railways, and the various branches of industries connected with them, would, in the judgment of the companies, forestall by two years the great industrial manifestation to take place in 1889, and would deprive it of an important part of its attraction and splendor. The six companies, therefore, consider it their duty to put all their forces in reserve for the centenary. Finally, the companies have called attention to the fact that a congress similar to that projected by the committee was instituted by the International Railway Association of Brussels in 1885, and the association is working regularly in conjunction with the delegates of the several governments interested, and the administrations of all French and foreign railways. The International Railway Association has decided that the congress of railways shall meet at Milan in 1887, and at Paris in 1889. Under these circumstances the six companies have unanimously repeated their refusal to participate in the undertaking of the railway jubilee committee. The reasons given for non-participation appear to us unanswerable, and may tend to damp the ardor of those who are in favor of this year's exhibition.—*Iron* (*London*).

Goliath Rails.

Engineering states that the paper lately read by Mr. C. P. Sandberg before the Institution of Civil Engineers, pointing out the inadequate weight of the rails used on the Continent, has induced the Belgian government to order some heavier rails, in order not only to meet present needs, but to provide in the future for the increased speed of traveling demanded by the public, and enforced by the competition of the leading lines.

Rails of exceptional strength are to be laid down by the administration of the Belgian State Railway on certain busy parts of their system. The Société Cockerill is rolling some hundreds of tons of rails, weighing 50 kilogrammes per metre (101 lbs. per yard), and known as "Goliath" rails. These are of the Sandberg section, slightly modified by M. Flamache, and are intended to be laid down on a section over which it is designed to run trains at a higher speed than hitherto attained. If the experiment proves successful it is hoped that the journey from Brussels to Antwerp will be reduced to half an hour, and that on the Ostend-Verviers line the journey will be effected in three hours. This, together with the improved service from Dover to Ostend, will greatly shorten the time of traveling from Belgium to London.

A New Car Wheel.

Mr. Hervey W. Fowler, of Chicago, has devised a new steel car wheel. The metal is taken in the form of a cast blank for each wheel, heated to a temperature lower than that used for rolling steel rails, and is condensed by rolling to a circular form. The pressure in the process of rolling reduces the diameter of the blank two inches. *The Mining and Scientific Press* states that a Chicago company has been organized to manufacture these wheels, and have purchased seven acres of ground near Chicago, on which works with a capacity of 80 wheels per day will be erected.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Years ago, before the birth of many of the present generation of trainmen, wide-awake superintendents observed the tendency of brakemen to disconnect the bell rope, take in the red light, wash their hands and generally prepare to adjourn, some distance—from 5 rods to 5 miles—before reaching the end of the trip. And although this eminently human habit is still allowed free play, as of yore, on some obscure lines, it is somewhat surprising to find one of the most crowded lines in the world, the cable road on the New York and Brooklyn bridge, suffering from an accident resulting from it. "It was only a little one;" only one passenger was hurt, and he but slightly; but the taking in of a red tail light only about *fifty feet* before reaching the terminus was shown to have in it the possibility of smashing cars if not of killing passengers. After the train had stopped at the Brooklyn terminus the brakeman took in his red light; but in moving a few feet further on the cross-over track one car was derailed. In looking to the accident the brakeman forgot that his tail light had been taken in, and the following train came upon him. Trains are run very close together and of necessity have to depend almost wholly at night upon the red light. In ordinary railroading the rule requiring terminals to be approached under control would apply; but with such dense traffic as has here to be dealt with the term "under control" has very important limitations, and is a very different question relatively. Eternal vigilance is the price of—good discipline as well as of other valuable things.

The rail section of the Lehigh Valley, illustrated in connection with a worn rail in this number, brings out one point which has been made against splice bars; that is, that they made it impossible to use a pear-shaped head—assumed to be a constructively correct shape.

This objection certainly did apply to iron rails which gave way by splintering off on the inside of the head. It does not lie against steel rails, as is made clear by the wear which has here taken place. The wear in this instance had not affected anything but the inside and upper faces of the rail-head, which was perfectly intact below. The specimen from which the cut was traced does not show the least variation from the normal shape on the lower side of the head, and the wear which has taken place has been made as sharply as if the head had been cut out by a planer, except on the top where flow has taken place under the influence of heavy pressure.

The deduction from this is that the splice angle might be made still sharper with advantage for wear, and any material put on below to give it the pear shape would be practically thrown away.

An interesting letter, which we publish in another column, objects to our statement of last week that "so far from the canal regulating the rates of the railroads, it is the railroads' attitude toward one another which decides the amount of traffic that may go by canal." It says that this is only true in times of reckless railroad warfare, and under disastrous disregard for the interests of the stockholders; and implies that the canals cannot meet such competition because canal men are handling their own money instead of other people's.

We cannot help thinking that there is a fallacy in this last statement. When the canal men pay tolls they are exactly in the position of a railroad which tries to pay interest. When they do not pay tolls, they are in the position of a railroad running for operating expenses. In other words, a railroad which is run in reckless disregard of investors' interests, stands on the same commercial footing with a canal which pays no interest because the state furnishes the waterway free.

If the proposed enlargement of the Erie Canal were carried out, no one would expect that the traffic could pay high enough tolls to yield a fair interest on the capital invested. The state would furnish the money which would enable the canal-boats to pay operating expenses and at the same time keep down cost of transportation; putting them thus on a level, not with a paying railroad, but with a bankrupt or recklessly managed one.

Our correspondent's other point, that the canal charges furnish a maximum which railroads cannot exceed, is undoubtedly true. At the same time it is only a half truth. The canal regulates the railroad, but the railroads probably regulate the canals still more. It is railroad enterprise which has brought down canal charges and canal tolls. The railroads have been the aggressors in the fierce competitive contests which have reduced the rates to their present level. However true it is that the canal prevents the railroad charges from going up, it is equally true that the railroad is what has made the canal rates go down. Canal charges before the day of railroad competition were vastly higher than the railroad charges to-day would or could be, if every canal in the country were destroyed.

One of the points raised on the occasion of the Spuyten Duyvil collision in 1882, and in other cases since, was the fact that if the train had been able to start with promptness the disaster would have been averted; in short, if there had been no air brakes, if the company had been less enterprising in this respect, it would have escaped a calamity, and, to follow on to the logical conclusion, railroad tracks are safe to run upon but not to stand still on. Mention is made of this just now merely to say that although such inventions as the "bleeder" referred to in another column are to be encouraged, and all reasonable facilities for rendering a train most completely under the engineman's control at any and every instant of its existence on the road should be given, the underlying principle that stoppages of *any duration* and at *any point* on the road must be always provided for in the signal system under which the trains are run should not be forgotten. Runners should expect to find warnings of danger ahead at *any point*, and care should be taken to see that they act on this hypothesis. If they see "bleeders" and similar devices adopted, the superintendent must see to it that they do not carelessly conclude that reckless running is to be encouraged thereby.

SECOND THOUGHTS ON THE INTERSTATE COMMERCE BILL.

An English statesman of the past generation said that the only thing which really alarmed him was to hear sensible men saying: "Something or other has got to be done." This feeling, he said, was responsible for more dangerous legislation than all the schemes of rogues and cranks put together.

He might have used the Interstate Commerce bill as a strong illustration of his view. It was unquestionably due to this feeling that the bill was passed in its present shape. Men demanded some action. A great many of them thought that any action whatever was better than none at all, and were prepared to vote for a measure without being clear as to its consequences. Mr. Cullom himself seems to have shared this feeling. For fear that legislation should be delayed till another session, he allowed the insertion of an absolute prohibition of pooling in the conference bill, and admitted a section with regard to long and short haul, of whose meaning no one is sure. There can hardly be any doubt that it was made vague on purpose. It was thought that any clear and unequivocal law on the subject would meet with opposition enough to defeat it. They, therefore, drafted a section which each man was free to understand in his own way, and trusted to the future for its interpretation. It was precisely the case which the English statesmen had in mind. The public wanted something. Neither they nor their representatives were at all clear what they wanted. As a result, they got a law concerning which nobody can tell what it means or how it will work.

To-day neither the railroad agents nor the railroad managers know what the law will allow them to do. Nor will they know for many months to come. If they would protect themselves they are obliged to deny to shippers many facilities which have come to be almost indispensable for the business of the country, or else grant them in such a secret and underhand fashion as to do a great deal of harm. It is not too much to say that the indefiniteness of the law does, for the present, all the harm which could be done by any construction of it whatever. It hampers business as badly as a much severer law, while producing as much uncertainty as would be involved under the loosest law or under no law at all.

It is curious to see the change which has taken place in the attitude of some of our leading newspapers. Before the bill became a law they were urgent in its favor, to-day they are full of doubt as to its workings. Perhaps the most striking instance is seen in the case of the New York *Sun*. As long as there was a chance of the bill being defeated the *Sun* supported it vigorously. Had it been brought to naught no newspaper would have been louder in denouncing the influences opposed to it. But no sooner had it passed both houses of Congress than the *Sun* was frightened at what had been done, and called upon the President to veto it. It demanded the law when people were opposed to it, but it opposed the law as soon as it was brought face to face with the problem of its practical workings. When an ably edited paper like the *Sun* admits that it supported the bill through ignorance, it is a striking commentary on the dangers of letting legislation be guided by sentiment instead of reason.

Meantime the New York *World* has discovered a new danger in another quarter. They are afraid that the appointment of the Commission will increase railroad influence in politics. They say that, if the Commission were controlled by the railroads, it would be "a worse danger than the people have yet encountered," and they are obviously afraid that such a thing may happen for they add that, in New York and New Jersey it would not be difficult for the railroad corporations, moved by a common interest, to control a Presidential election; and point out that the railroads have such a common interest, because the next President will in successive years appoint four members of the Commission, and thus have it in his power to control its character.

Now, whether this particular danger have any foundation or not, there is an important truth connected with it. Every additional means for political control of railroads gives an additional motive for railroad control of politics. The closer you bring the two together, the more the inside rings in both will play into each other's hands and prevent independent expression of popular feeling either by voters or by stockholders. And when you propose to carry out a State railroad system, you simply fuse the two rings into one. It is all nonsense to say that the more the people control the railroads the more the railroads will be managed in the public interest. Politics being what they are, it simply means increased inducements for ring rule.

It has been a common criticism upon the labor agitators that they can only hold together as long as they are presenting grievances, and cannot unite upon anything which is at once positive and practicable. It has also been said that they are fond of fighting in the dark. Both these criticisms apply forcibly to the action of those who supported the Interstate Commerce bill. They had a number of grievances. They could not agree upon any positive measure whose consequences were clear and definite. They therefore fired a shot in the dark. And now the New York *Sun* is afraid that they may have been hitting the wrong object, and the New York *World* is seized with fear that the effect of the recoil may be worse than that of the shot.

We do not ourselves apprehend any very destructive consequences, either industrial or political, from the present law. The uncertainties connected with it will make the process of adjustment a hard one; quite as hard, probably, for the shippers as for the railroads. But if it teaches people not to support a bill until they know what it means, the experience will be cheaply purchased.

AUTOMATIC BRAKES.

Prevention being better than cure, one of the most fascinating ways of looking at the problems arising from a great disaster like the recent one in Vermont is to consider the means of preventing the very first cause from being set in operation. Thus, allowing that a defective axle caused the derailment, some people would exert their whole power on the improvement of axle manufacture; or if it were a poor rail

would give the whole attention to improved track, regardless of plans for mending matters after the train had once jumped off. People less one-sided would give very full attention to means of stopping trains after being derailed, regarding such matters as guard timbers and fire-prevention secondary to this; and so on. While not acceding to this view, and while regarding a guard timber (for instance) as a highly valuable thing, notwithstanding it is to a road's discredit to ever run a train against one, we do not wish for a moment to allow it to blind us to the value of appliances to prevent derailment, by reason of the costliness of the latter and the cheapness and simplicity of the former. The means of rendering a train brake 10 or 20 per cent. quicker in action may cost, perhaps, several times as much as a simple system of guard timbers, and involve very much more care and calculation, but yet if it will some time possibly save a score of lives it deserves attention and cannot rightfully be ignored.

These considerations arise in view of the long distance the Central Vermont train ran (and at a low speed) after the derailment occurred, and, as was remarked last week, a train brake should have every reasonable auxiliary that can possibly hasten its application in case of danger. In other words, we regard the discarding of the original Westinghouse device for releasing the air whenever the car should drop a few inches (as in derailment) as warranted only after very careful and painstaking efforts to remove its objectionable features. Such appliances should not only receive attention, but should be personally investigated by master car-builders or others having the rolling stock—and consequently the general interest and reputation—of large railroads in their charge.

It is not enough to let one or a very few specially liberal or enterprising roads do all the experimenting, and all the rest stand back and wait for the results to be published free to the world. The railroad interests of the country are too great to be allowed to suffer while waiting for some one narrow line of experiments to be slowly worked out. Clear-headed men should combine and push things through to some definite conclusion. The all-important question with master car-builders just now is not that of uniformity in axle-box lids, nor whether white paper or pink should be used for making out bills of repairs on foreign cars; and even such humane inquiries as those concerning car couplers and freight train brakes cannot reasonably be allowed to crowd out *any* matter, however small, which involves safety to passenger trains. The heads of the technical departments should receive the active sympathy and interested advice of the general managers. The former should indeed have full power and positive authority in their departments and the manager should indeed be able to feel perfect confidence in them; but yet, in the case of problems that are engaging the lively interest of the public, as those arising from a great disaster are now and always will be, he should have such intelligent and well-founded views as shall give the greatest moral support and encouragement to his subordinate, inspiring him to rise to his highest abilities.

UNDERGROUND VS. ELEVATED RAILROADS.

The removal of the injunction against the New York Arcade Railroad, which probably removes the last obstruction other than financial to the prosecution of this enterprise, raises the question of the general desirability of underground railroads.

So far as yet constructed, that is in the case of London, they have proved notably less popular than elevated roads, as built in Berlin and New York. This is, of course, largely due to the imperfect ventilation and lighting of the tunnel, but it may be presumed that if the management of the London underground could see its way clear to increasing its traffic to the enormously greater figures of the New York elevated roads* it would be willing to incur a very large expense for so doing.

The Severn Tunnel is reported to be so perfectly ventilated by artificial means that the air in the tunnel seems as fresh and pure during the passage of a train as that overhead, and electric light would give the means of producing a very close approximation to the convenience, if not to the agreeability, of daylight. There still remain, however, the noise of a tunnel, the absence of outlook, and the sense of being shut up in the bowels of the earth, which are to the majority of travelers very disagreeable factors in railroad travel, and deterrent features from traveling by a road, if they can make as good or nearly as good time by some other means of locomotion. It is necessary to try the experiments of tunnel riding day after day before one can reach a realizing sense of these elements.

So far as comfort is concerned, there is undoubtedly one, and only one, feature of the underground roads that compares favorably with elevated structures, and that is the small saving in stairs from the street due to the necessity of climbing from the rail level to the car-floor level, in the case of the elevated, and vice versa, to the shortening the climb by this height in underground roads. This may seem a small feature, but it undoubtedly would count for something, though not outweighing the other points mentioned in favor of roads above ground.

Passing to considerations of public advantage, it is to be observed that the underground schemes in this country almost invariably presuppose the occupation of an underground street space. The superior advantages of traffic above ground are sufficiently established to make any projectors who propose buying a right of way naturally run above ground instead of below, though even here it is obvious that the underground road would have the advantage constructively, in that it could either leave the present buildings intact or could put up others over its line which would be but little interfered with by the traffic passing below. The only escape from this for an elevated road is by the imposing scheme put forward for Rapid Transit in New York by a correspondent in another column; that is, by putting the road on the house top level and providing it with power elevators.

There is one objection to underground roads occupying sub-street space, which is almost always overlooked in the consideration of these projects, and that is the monopolization of a space which is becoming increasingly in demand for all sorts of minor conveniences of civilization, such as electric wires, steam heating pipes, pneumatic tubes, water and gas pipes. It must be remembered that the space is limited for all these things. They cannot well be placed below drainage level, nor is it generally desirable to put them above frost level. At any rate, if the streets were tunneled, these numerous appliances must be kept below the roof of the tunnel, and room must be allowed for their operation and repair.

The schemes for an underground road in Broadway, New York, have claimed to provide for all of these, but those who know the complication and multiplication of these appliances at certain points, and the innumerable connection, to side streets and houses, see very forcibly the difficulties of carrying through an underground railroad without forcing the other appliances in great measure out of the street. This should not be done; for all these matters require facility of access to the houses along their route, which the railroad does not need, and, furthermore, a requirement to purchase a right of way through private property would be prohibitory to many improvements, while the success of metropolitan railroads in New York has shown conclusively that a road commanding the enormous traffic of the populous districts of our great cities can pay a profit even on the added cost due to right of way purchase. This being the case, why should our cities give away the valuable space beneath their busy streets to add to the profits of corporations like the Manhattan road in New York?

Coming now to the relative economy of construction above and below ground, we shall find that where both constructions have to buy their right of way, the underground would be the cheaper, taking into account the greater ease of utilizing for building purposes the ground occupied by it.

The scheme outlined by our correspondent above referred to is shown by him to be capable of paying moderate interest even with the burden of the bridge proposed, which could not be expected to be very profitable at once; and without it, would clearly pay at least four per cent. immediately, even if we allow a little more for maintenance and operation than he has estimated, which would probably be necessary by reason of the elevators and the greater expense of maintaining four tracks with not much more business, two of them being used too for very fast travel.

FREIGHT-TRAIN BRAKES.

The fact that the representatives of no fewer than ten different forms of freight-train brakes attended the recent meeting held at Pittsburgh to determine the rules and tests to be adopted in the forthcoming trials, is strong evidence of the great and increasing interest felt in the question. Only five different brakes put in an appearance at the Burlington tests last July, but the number to be represented in the approaching tests in May promises to be considerably larger.

The systematic manner in which the trials were conducted, and the accurate observations made as to the behavior of the different brakes, not only developed several valuable facts as to the freight train brakes and working in general, but showed that each brake possessed some hitherto unsuspected faults. This discovery enabled the brake companies to at once take steps to improve their brakes, and even if the trials have no other result, railroads will have the choice of greatly improved brake appliances.

The advent of electric brakes in the forthcoming trials also marks an advance in the freight train brake question. As far as we are aware, no electric brakes have ever before entered into a serious and elaborately conducted trial against other forms of train brakes. The performance of the electric brakes will be awaited with much interest In one at least, the brakes will be applied by electricity, but the power will be furnished by compressed air. Such a combination has been often proposed, but has probably never before been put into actual practice.

Some alterations have been made in the rules governing the tests. The brake committee being anxious that the tests should not occupy too much time, suggested that all superfluous tests should be omitted, retaining only those which experience at the former trials had shown best developed the special fitness or unfitness of a brake for freight train service. The former trials included trains of 50 and of 25 cars. The trains were either (1) wholly composed of loaded cars, or (2) partly of empty and partly of loaded cars, or (3) wholly of empty cars.

These numerous varieties of trains and the necessity of loading and unloading a large number of cars greatly lengthened the duration of the trials. The committee, therefore, wished, if possible, to make the trial exclusively with one type of train, composed of fifty box cars, a certain proportion of the cars being loaded and the remainder being empty. The train would thus fairly represent average actual practice, trains wholly composed of either empty or *fully* loaded cars being exceptional. It is obvious that if a brake will act well on a train of fifty cars, it cannot fail to do admirably on a train of twenty-five cars, and therefore trials of twenty-five car trains were unnecessary. It is also evident that if a brake will stop a train composed partly of loaded and partly of empty cars without shocks or slid wheels, it will undoubtedly handle a train composed wholly of either empty or loaded cars. With the latter train, the engineer can apply his brake with considerable force and yet not slide a wheel, but with a mixed train, the leverage must be so adjusted that the wheels on the empty cars are not slid. The shocks, too, are likely to be more fully developed on a mixed train than on one where an equal braking force is applied to cars of the same weight.

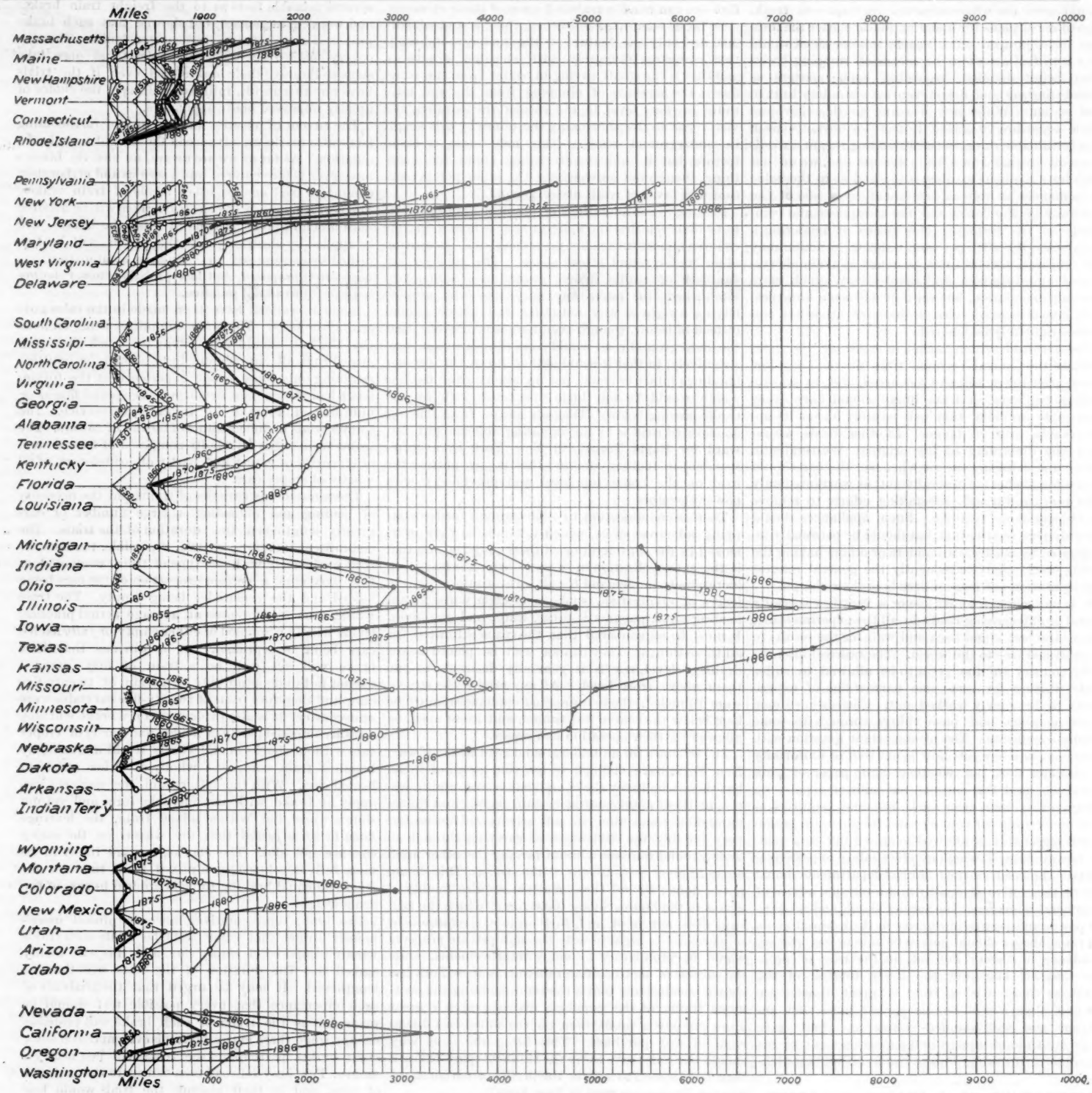
The brake representatives, however, almost unanimously urged that some tests be made with trains wholly composed of empty cars, and this was finally agreed to. The duration of the tests will thus be lengthened. It may be urged that the trials are of such importance that every possible test should be made, but as the trials of each brake will probably occupy some three entire days, it is evident that if some eight brakes participate the trials will last nearly a month. Few busy railroad men can spare that amount of time, and in their absence the trials would lose much of their interest. The presence of a large and influential body of railroad men at the trials will not only add to the value and completeness of the trials themselves, but will also be of great value to railroad officers. Many valuable ideas may be exchanged, and many vexed points in freight train working are clearly brought out in such tests.

The relative strength and merits of different systems of constructing cars, the forms of truck centre plates, the convenience of end platforms, side and end ladders and various arrangements of hand rails were all clearly tested at Burlington in July last in such a manner as to be clearly visible to the naked eye of those on the ground. The old saw has it "that seeing is believing," and it certainly applies to points in railroad working, where actual experience often clinches an argument that has been fought on paper for years.

The rules for the brake trials recognize for the first time the importance of "shocks," and provide a standard of comparison for roughness in handling, and state definitely how shocks are to be measured and what constitutes a shock not permissible in ordinary working. The significance of the stipulations on this score and as regards close couplings, will be appreciated by those who took part in the last Burlington trials. It is to be hoped that in the forthcoming trials the shocks will be considerably diminished, partly by the improvements made by the brake companies in their own appliances, and partly by the diminution in the amount of slack in the couplings.

The provisions as to slack and couplers, and the restriction of the trials entirely to 50 car trains, show

* The London underground carried 80,474,550 passengers in 1886, against 115,109,591 on the New York elevated, which is, however, of considerably greater length.



PROGRESS OF RAILROADS IN THE UNITED STATES.

the progress this question has made. A year ago, such suggestions would have been regarded as somewhat unwarranted. Many considered that a train of 50 close coupled cars would not be handled by a light 17×24-inch cylinder engine, and the great majority of practical railroad men were unaware of the great difference in the working of power brakes on fifty and twenty-five car trains.

Some of the conditions of the trials differ from those which governed the Burlington tests last year. The Chicago, Burlington & Quincy management, though desirous of affording every facility to intending competitors are unable to furnish engines owing to the heavy freight movement The brake companies will therefore have to furnish both engines and cars. Many have arranged to have the cars built to the specification of a railroad, whose property the cars become at the expiration of the tests.

Mr. Godfrey W. Rhodes and the general management of the Chicago, Burlington & Quincy Railroad deserve the highest credit for the intelligent and public spirited efforts they have made to ascertain the facts in a difficult and important railroad question of the day. Were their example more generally followed, railroad traveling and transportation in this country would not only be made infinitely safer to life and limb, but would become considerably more regular and speedy. The diminution in the 180,000 accidents that a correspondent calculates takes place annually in this country would mean a great saving of time as well as of lives and material. A wreck delays trains within a large radius, and every delay means increased expense, for time is money in railroad affairs as in everything else.

A considerable advance has been made in the freight train brake question, and it is to be hoped that the results of the trials at Burlington in May next will not only go far to settle the question as to the future freight train brake for the country, but will also stir up the allied great railroad problem—the car coupler question—and advance it further towards a decision. The freight train brake question is young, but it is certainly making greater progress than many older problems, unless the Commitee of the Master Car-Builders' Association who have the car coupler question in hand should advance more rapidly than they have hitherto done.

Growth of the Railroads in the United States Shown Graphically.

The diagram given in this number to illustrate the growth of the railroad system of the United States is divided into groups for the convenience of comparison of the railroad growth of the different sections of the country, and is compiled from the latest returns available.

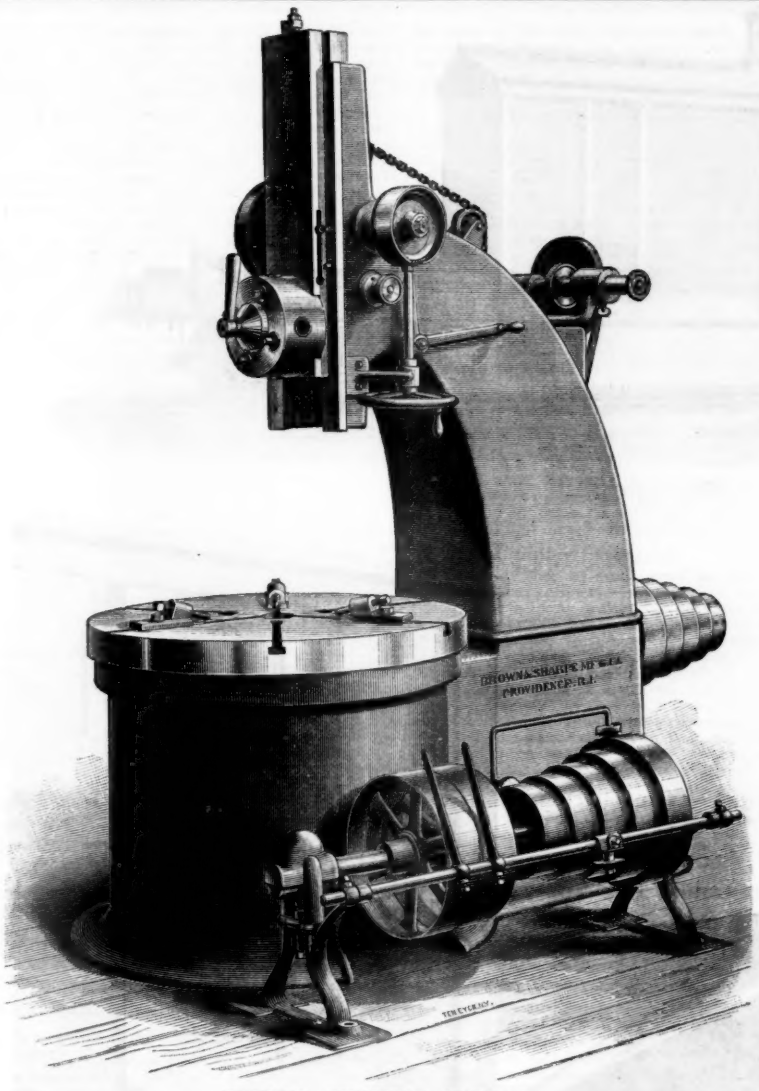
The states and territories have been arranged in each group to avoid too much confusion of lines and not in any geographical order. Each line marked with a year shows by its intersection with the line of any given state the total amount of railroad in the state at the end of that year; thus Illinois, the banner state at present, shows, at the end of 1886, about 9,600 miles of road, while in 1870 it had 4,850 miles, having nearly doubled its railroad system in the time between those dates. The 1870 line has been made heavy, as being the first year in which all the groups showed some development of railroad. Careful study of the lines will reveal a good many idiosyncrasies of growth. Perhaps the most remarkable is Texas, which up to 1870 had less railroad than Maine, New Hampshire or Maryland, but in 1886 has almost as much railroad as New York, having multiplied its railroads more than ten fold in the 16 years.

The effect of the financial crash of 1857, followed by the war, can be followed by means of this diagram in the different groups. In New England very little was done in the decade 1855–65, and in the South nothing to speak of was done in the way of railroad building during the war, though there was the most active period in its history in the 5 years preceding, if we except the last 6 years.

In the middle group it was in this period that New York lost its supremacy to Pennsylvania, whose progress has been remarkably steady ever since 1845, with the single exception of the melancholy time from 1875 to 1880. It is noticeable that the growth of Pennsylvania was greater during the war period than in any other five years except the last, while the rest of the country remained very dull. This is probably due in the main to the opening of the oil regions and to the increase of the Pennsylvania coal and iron industries under the protection of the war tariff and the war demand.

Chicago Shipments in January.

The through shipment from Chicago (not including live stock and dressed meats) by the pool lines to trunk line western termin and east during the month of January was 177,771 tons. This does not include the Chicago and Atlantic



VERTICAL CHUCKING MACHINE.

Made by the BROWN & SHARPE *Mfg. Co., Providence, R. I.*

tonnage, which is not reported. Probably if that traffic were included, the total for the month would be about 200,000 tons. Thus the shipments in January during the last eight years have been :

Year.	Tons.	Year.	Tons.
1880.	165,494	1884	234,704
1881.	267,646	1885.	322,073
1882	321,148	1886	167,665
1883.	271,162	1887.	200,000

While the shipments last month were considerably more than the business in January, 1886, it was a very much smaller traffic than during any other January since 1880. It must also be borne in mind, that prior to 1884 the business from the outside junction points was not included in the reports of Chicago traffic.

The rates this year are on the thirty cent basis ; and last year they were on the basis of twenty-five cents. Therefore, there must have been a larger margin of profit this year than in January, 1885.

The January shipments of cattle and dressed beef from Chicago by the pool lines have been as follows, in tons :

	1883.	1884.	1885.	1886.	1887.
Cattle	45,952	44,139	42,745	33,366	34,706
= Dressed Beef	26,192	25,159	24,364	19,035	19,782
Dressed Beef	11,704	14,417	17,950	22.316	25,943
	37,896	39,576	42,314	41,351	45,725

Seaboard Receipts of Flour and Grain in January.

The receipts of flour and grain at the four Atlantic ports in January were 14,110,621 bushels, as against 19,566,083 in December.

The January receipts at the four ports for the last five years have been :

	1883.	1884.	1885.	1886.	1887.
Bushels	18,646,338	11,096,709	16,431,905	10,708,311	14,110,621

New York's percentage of the January receipts at the four ports has been :

	1883.	1884.	1885.	1886.	1887.
Per cent	49.9	54.6	52.1	45.2	49.1

January Flour and Grain Receipts at New York.

We give below a statement of the flour and grain receipts at New York during January, also a comparison with the receipts in the previous month :

	Jan., 1887. Bushels.	Dec., 1886. Bushels.	Inc. or Dec. Bushels.	P. c.
N. Y. Central	2,157,930	2,236,515	— 78,585	3.5
Erie	1,721,532	1,533,188	+ 188,344	12.3
Pennsylvania	540,915	767,682	— 226,767	29.5
Lackawanna	626,389	817,430	— 191,041	23.4
West Shore	958,805	2,195,261	— 1,236,456	56.3
Various	845,030	1,027,149	— 182,119	17.7
Total rail	6,850,601	8,577,225	— 1,726,624	20 1
Coastwise	75,792	112,564	— 36,772	32.7
Canal		374,500	— 376,500	
Total	6,926,393	9,066 289	— 2,139,896	23.6

While the receipts in January were nearly 24 per cent. less than those of the preceding month, it was an average January business ; as is shown by the following statement of the receipts for that month during the last six years :

	1882.	1883.	1884.	1885.	1886.	1887.
Bus.	6,136,821	9,183,011	5,971,629	8,559,382	4,838,290	6,926,393

The emigration from Hamburg during the year 1886 was 88,633 persons, being about 15 per cent. larger than the number leaving Bremen. For the last five years Bremen has had the lead, having in 1883 sent out 109,881 persons to Hamburg's 89,465.

The broken rail that figured in the White River accident, which in the early testimony was vaguely referred to as having flaws, proves on careful examination by Mr. Robert Fletcher, professor of civil engineering in Dartmouth College, to have been a very bad one, serious defects in manufacture having been detected by him. This, with the fact that the axle was broken in the middle, an unusual place, weakens the statements concerning the finding of fragments of the truck farther from the bridge than the break occurred, and makes the theory that the rail was the original cause of the derailment a highly plausible one.

The latest estimates of the casualties are as follows : Total on train, 91 ; accounted for, 87 ; still missing, 4.

All the bodies found have been identified, but it is very doubtful whether the real number of persons found is known, parts of several bodies very likely having been picked up in one box.

The *Mexican Financier* of Jan. 29 gives an interesting *résumé* of the work of Mr. Islas in bringing up to efficiency from a very dilapidated condition the Mexican government telegraph lines, of which he was appointed manager in the fall of 1885. At that time the revenue was next to nothing, the lines being out of repair and the *personnel* demoralized. In the course of a year Mr. Islas systematized the business, organized districts, weeded out the politically appointed inefficients, put in improved apparatus, introduced duplex working where necessary, purchased 35,000 poles, repaired 11,000 kilometers (6,831 miles) and built new 1,675 kilometers (1,040 miles) of line, including several tall towers at river crossings, and has accomplished numerous other beneficial changes, which will obviate the necessity for numerous large annual expenditures; and moreover, has done all these things with very moderate appropriations ; which, however, in spite of their reasonableness, were obtained only after untangling much official red tape. Important towns have been brought into telegraphic communication which before were isolated.

We understand the New York Central & Hudson River road is about to equip a train with the Martin anti-fire car heating apparatus, and that it will probably try it on the "Chicago limited." This heater is also being tried on the Chicago, Milwaukee & St. Paul, and Long Island roads.

The report of the last meeting of the New England Railroad Club will be found in another column. The chief feature of interest was the description of the Sewall heater, with which the Maine Central road is experimenting.

Some of Mr. Gold's statements were noteworthy, as coming from one conversant with the facts; especially his statement concerning the short time necessary to charge cars with heat enough for a lengthy run.

Mr. Henry L. Norris writes us in reference to the recent articles on the Norris Locomotive of 1836 :

The spring balance may have been wrong, but I am told it was *carefully tested*, and I do not think the pressure was much above 58 or 60 lbs., if at all. Regarding the weight of engine with water alone, I was unable to give the full weight in running order, having no record of it, so I wrote weight with water. I am not so positive in my statement that no bells were used at the time, but if so there were very few of them, and I am told they were not in use until later.

The locomotive trade in Great Britain is improving, one railroad company, the Lancashire & Yorkshire, having recently let contracts for 90 locomotives. The price, £37 10s. per ton, is, however, considered low. It corresponds to a cost of about $10,500 for the largest (class R) Pennsylvania consolidation engine and tender. The cost of the English engine is enhanced by the use of copper instead of steel fire-boxes, brass instead of iron tubes, and wrought-iron or cast steel wheel centres in place of cast-iron. The use of more expensive material thus nearly offsets the cheaper cost of labor. The cost of a Pennsylvania consolidation at present prices here may be taken at nearly $11,000.

The management of the New York, Lake Erie & Western is to be congratulated on the scientific railroad talent it has acquired in the last 15 months, and upon the sagacity shown in availing itself of this skill and experience in the departments generally considered as outside of the technical lines, as evidenced in the elevation of Mr. Soule to the General Managership.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887 is given in the current number of the *Railroad Gazette* as follows :

Blue Springs, Orange City & Atlantic, built between Orange City, Fla., and New Smyrna, 20 miles.

Central Pacific.—The *Oregon Division* is extended from Edgewood, Cal., north to Montague, 22 miles.

Chicago, Kansas & Nebraska.—Extended from Hebron, Neb., to Nelson, 30 miles.

Chicago, Milwaukee & St. Paul.—From Gault, Mo., south to Chillicothe, since Jan. 1, 20 miles.

Kansas City, Wyandotte & Northwestern.—From Wyandotte to Menager Junction, 17 miles.

Rome & Decatur.—Between Rome and Gadsden, Ala., track laid for 15 miles.

San Bernardino & Los Angeles.—Extended from San Bernardino, Cal., north 5 miles.

This is a total of 129 miles for the week, making 310 miles reported thus far for the current year. The new track reported to the corresponding date for 14 years has been :

Miles.	Miles	Miles.	Miles.
1887 310	1883 168	1879 70	1875 80
1886 114	1882 419	1878 170	1874 83
1885 102	1881 173	1877 72	1873 226
1884 155	1880 246	1876 90	1872 169

This statement covers *main track only*, second or other additional tracks and sidings not being counted.

Vertical Chucking Machine.

This machine was designed by the Brown & Sharpe Mfg. Co., of Providence, R. I., to meet a long-felt want and supply a ready and convenient method of chucking countershaft pulleys or works of similar character. It is claimed that with this machine from two to four times as much work can be accomplished in a given time as can be done upon an engine lathe, and in a much superior manner, the work being more easily trued and fastened in place than upon any machine having a horizontal spindle, and the different tools in the turret head easily brought into operation in succession, while, from the perpendicular position of the same, the chips fall through the centre of spindle of revolving table to the floor, causing no trouble by clogging of reamers, etc.

It has the capacity to take a pulley 36 in. diameter, 18 in. face, and a hub of 12 in. in length, and to bore a 4 in. hole in same, making two or three cuts, and finish by reaming, without removing the tools or work.

The revolving table is driven by a 5-step cone for 3 in. belt, and geared 6 to 1. Steps of cone so graded as to make cutting speed uniform for 5 different diameters of holes.

The turret has four holes 1¾ in. in diameter, and is securely clamped in position. An adjustable dog allows the locking pin to be withdrawn at any part of its upward motion.

The turret slide has a movement of 21 in., and an automatic feed which can be easily and quickly changed from the finest ever needed to the coarsest required ; it has quick return by hand, and is counterbalanced by weight inside of column.

The weight of the machine complete is 4,400 lbs.

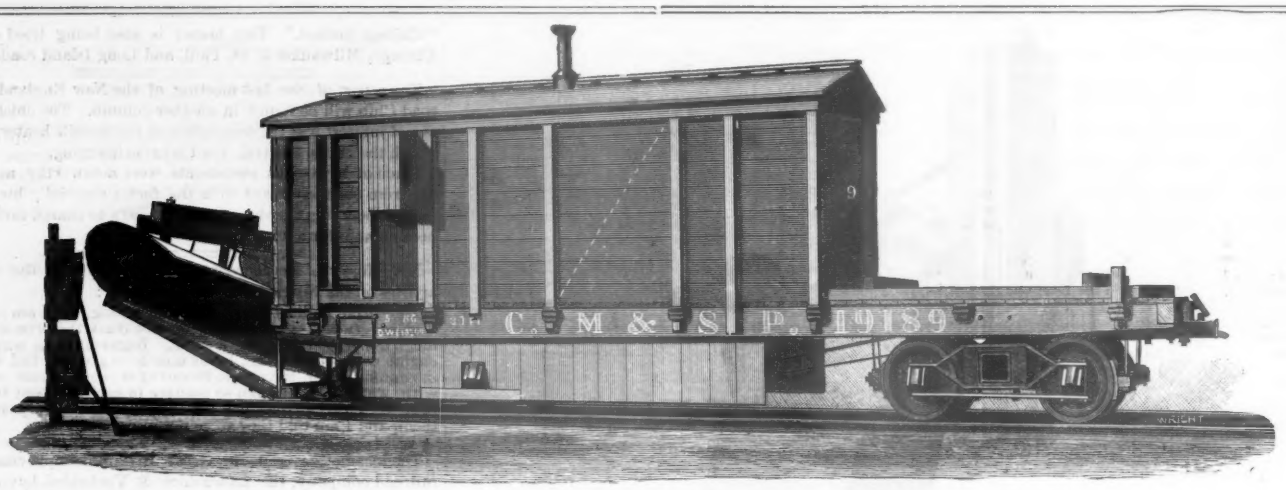
A Snow Flanger.

SANBORN STATION,
Chicago, Milwaukee & St. Paul Railroad.

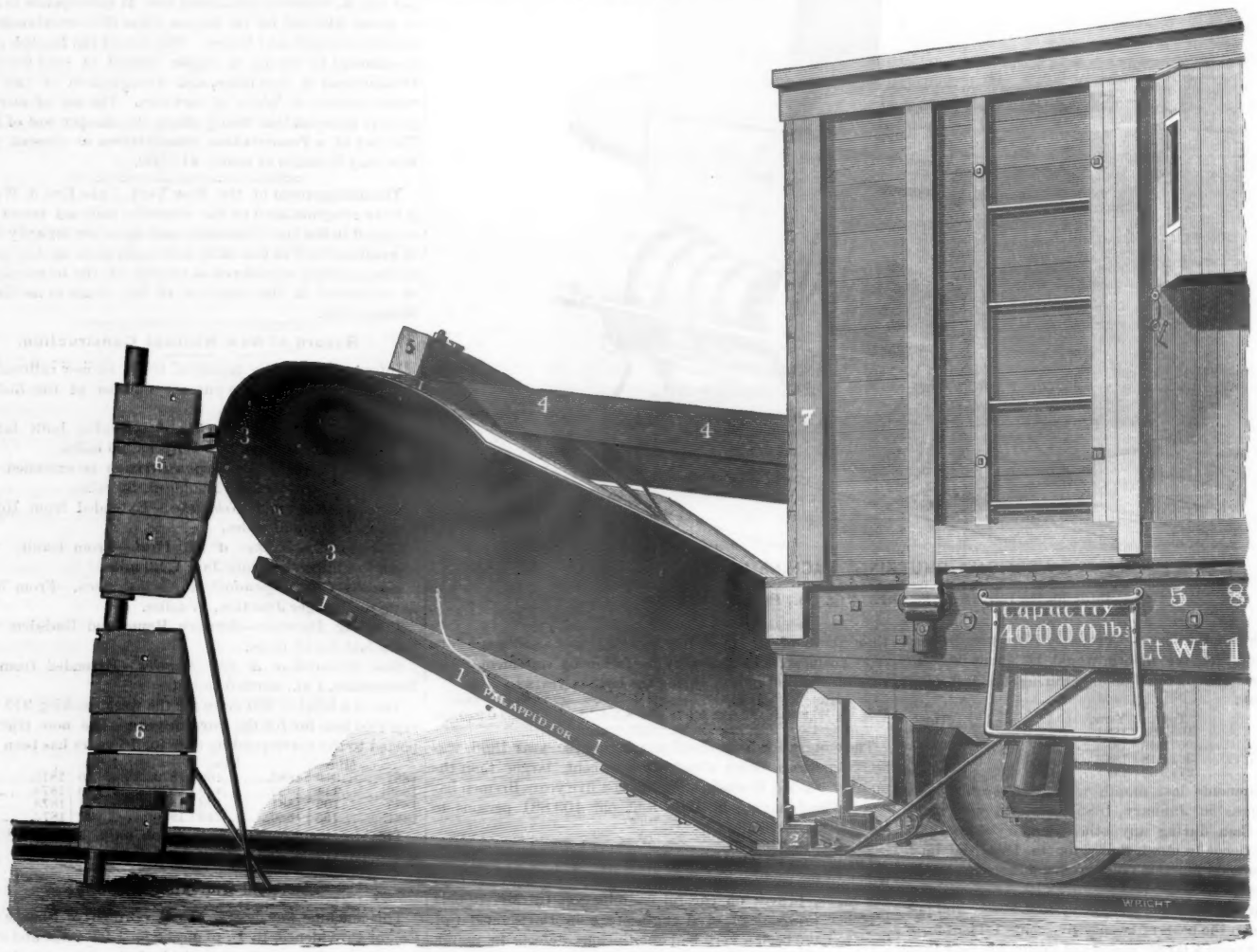
TO THE EDITOR OF THE RAILROAD GAZETTE :

I have been thinking for some time of writing you a short description of a flanger which I have been using for the past three winters and which we consider a "daisy."

I inclose you two photographs, which give a very good idea



General View



SNOW FLANGER.

Chicago, Milwaukee & St Paul Railroad.

of how it looks and which will help very materially in understanding how it works.

It is not expensive, being built and attached to a common flat, from which it is removed when no longer needed. The flanger or plow is attached to the rear and is stationary, only the knives, which are fastened to a shaft (2), being raised and lowered as circumstances may require. The raising and lowering being done by means of a short lever attached to the center of knife shaft. This lever is connected to a longer one inside the cab on top by means of an upright rod. The long lever in the cab is raised or lowered either by a man stationed for that pupose or by means of an air attachment connected with the engine.

In the door on each side is set a projecting or bay window with double glass so it will not frost over ; these are for the lookouts, which are usually the train crew, to keep watch of obstru ctions, such as road crossings that are planked, and switches, etc., over which the knives must be raised.

In order to show where these places are, I have a wooden cross + made of a fence board eight foot high and a two foot piece across the top, set 200 feet each way from the point of danger. These are easily seen by the lookout, and there is no necessity to knock the knives off by running into switch rails or other obstructions.

The knife shaft (2) and (6) is made with the knives to cut ten inches outside of and on a level with each rail next to this ten-inch knife, at each end, is an iron shoe, steel-faced on the under side, which rides on the rails and holds the knives at a uniform depth. The two knives which come next the s oes on each side, and which we call the flanger knives, are eight inches wide and cut two and a half inches below the rail on the side next the rail and somewhat less on the inside edge, as they are arranged to cut on an oval to correspond with ballast in the track. These flanger knives are cut out on the lower inside edges where they come below the base of the rails so as not to hit the ends of angle bars or bolt heads. Extra knife plates are carried in case one is broken or lost, and another can be put on in a very short time. This will not often occur, however, if care is taken when running. Mine has been run about 1,000 miles this winter without the loss of a knife.

The space below the car sills on each side down nearly to the top of the rail is boarded up tight, and the front end of the cab is left open on top, with a slanting partition between the open end and the rear end where lookouts are stationed, as indicated by dotted white lines. Under this open end or *hood* the floor of the car is removed, so that in running we catch all the wind possible. When running thirty-five miles per hour the air rushes out at the rear with remarkable force. The snow which is being taken up out of the centre and flanges is thus carried up and outside of the banks of all ordinary cuts, and is thrown so far that it never rolls back on the track. I have often seen the snow thrown as high as the telegraph wires.

J. E. Cox,
Roadmaster.

P. S. This flanger was gotten up by Mr. T. A. Fraser, our general round-house foreman. It has worked well for us, and similar flanges are used on other roads, the Burlington, Cedar Rapids & Northern having three.

Yours, J. E. C.

THE SCRAP HEAP.

Exhibition of Car-Heating Methods.

The New York State Railroad Commissioners gave a hearing, on Feb. 16, at Albany, on the best methods of heating cars. Many inventors of apparatus for heating cars were present, among the number being James Armstrong, Bridgewater, N. Y.; P. J. Grady, Rondout, N. Y.; J. T. Woodward and D. D. Sewall, representing the Sewall Safety Car-Heating Co., of Portland, Me.; W. C. Baker, President of the Baker Heater Co., New York ; C. T. Shepard, Albany ; J. W. Cloud, of the Erie Railroad ; L. Packard, Master Car-Builder of the New York Central & Hudson River Railroad ; H. C. Blackall, Master Mechanic, Delaware & Hudson Canal Co.; E. M. Reed, Vice-President of the New York & New Haven Railroad ; Frank E. Shaw, of the Martin Anti-Car-Heater Co., and Andrew E. Warner. Mr. Armstrong's plan was to drive heated air by a force pump to a drum in each car, and thence through registers. Mr. Woodward described the system now in operation on the Maine Central Railroad, by which steam was taken from the locomotive. The device consisted of a valve operated by disks. One disk was placed in each car. The pipes were run along the side of the car and were regulated by the disk. The coupling of the pipe hangs down between the cars and is readily and easily made. A hole the size of a pin in the boiler and engine will give all the heat desired to heat a train of five cars. The condensation per car is about one and a half pails of water per 100 miles. No more coal is used than without the heater. C. T. Shepherd, of Albany, described a method of heating and lighting by electricity. J. W. Cloud, formerly mechanical engineer with the Pennsylvania and now Superintendent of Motive Power of the New York, Lake Erie & Western road, said that the heating and ventilating apparatus recommended by the Pennsylvania Railroad Commission had proved successful on the cars of the roads in that state. He did not think a car could be properly heated and ventilated unless the air was heated before entering the

car. The tirade of the newspapere against stoves in cars should be against the egg-shell stoves. The properly constructed heater is safe. He had carefully studied the question, and his conclusion was that, to heat cars to 70°, and keep them at that temperature in all weather which does not drive the mercury below zero, it requires only 1 per cent. of the locomotive's steaming power; one-half of 1 per cent. is sufficient when the temperature outside remains several degrees above zero. To heat a train of a number of cars will make no heavier draft on the steam treasury of the locomotive than it will to heat one car. Mr. Cloud was of the opinion that a stove properly incased and fastened in its place is safe.

Mr. Sewall, of Portland, exhibited rubber hose for making the connections for steam conducted from the locomotive to the different cars of a train. Mr. Baker said no rubber hose had ever been made that would stand the heat or friction for a month. Mr. Sewall replied that the hose he exhibited would last ten years. His apparatus was in successful operation on the Main Central road.

The Commissioners made close inquiry of Mr. Sewall and others about the effect on the locomotive of using steam from it for heating. Mr. Sewall said that in practice the draft of steam on the locomotive for heating did not perceivably diminish its power.

Hire a Sweet Girl Stenographer.

A general passenger agent is quoted as saying that "there is not pica type enough in all the printing offices of the country to print the tariff sheets for all the railroad stations, as the Inter-State Law requires."

Good Costume to Get Married in.

An order has been issued by the General Superintendent of the New York, Lake Erie & Western that the new uniform of conductors on that road is to be a Prince Albert coat with brass buttons, with vest and trousers to match.—*Exchange.*

[Frock coat, not "Prince Albert," waistcoat, not "vest." What part of the trousers will they sew the brass buttons to?]

Ethel's Earrings.

Ethel writes to ask "what songs do the rails sing to me when I sometimes rest my ear close down to their gleaming surfaces and listen." Well, Ethel, the refrain that is most popular to a musically inclined steel rail is, "What fond ties bind us here." But have a care, sweet child, and do not fall asleep with your ear pressed to the "gleaming surface" of a cold rail. Trains run over sleepers, and snap the fond ties that bind us here with a ruthless whizz that no one but an undertaker can discover any sense or elegance in.

A Name Costs Less than a Ton of Coal.

The soft coal producers, who have been nearly two months trying to form a pool, state that they have determined to call themselves a "Bituminous Coal Association," as the word pool has become obnoxious since the passage of the Interstate Commerce bill. They have agreed upon percentages, but refuse to give them official publication.

Change Cars for Tanganika, Nyassa and Mozambique.

A cable dispatch from Brussels says that "a company has been formed for the construction of railroads in the Congo State, Africa, Deputy Sebatier is President of the company.

Eternity via Pansyville.

A man with soft, gray eyes came down the platform of a country station where a train had stopped with a hot box, and pleasantly asked the conductor how many bridges had to be crossed between there and Pansyville?

"Three or four," replied the conductor.

"Well, are they real high ones over deep rivers?"

"You've guessed their nature," said the railway official.

"Stoves in the cars, I suppose?"

"Yes, we usually keep them inside the cars when the weather permits."

"Well, I reckon I'll try it," said the soft-eyed man to himself as he began to move away.

"Try what?" asked the conductor in a tone of authority.

"Oh, nothing much. You see, my wife's mother has been staying over to my house for about six years now on one of her little visits. She's been anxious to get over to Pansyville to see the new Baptist church there, and I thought I'd make inquiries to find out if the excursion would be an enjoyable one for her. How high is the highest bridge that you'll have to cross?"

"About 60 feet."

"Well, I guess you needn't hurry much over that hot-box. I'll have my wife's mother down here just as soon as she can get into her black bombazine. The dear old lady will be so pleased with her trip. Shouldn't be surprised if I gained a little flesh over it myself."

Long Mining Tunnels.

The Bauzeitung fur Ungarn in the following passage quoted by the Engineering and Mining Journal is in error:

THE LONGEST TUNNEL IN THE WORLD.—"An engineering work that has taken over a century to construct can hardly fail to offer some points of interest in its history, and illustrate the march of events during the years of its progress. An instance of this kind is to be found in a tunnel not long since completed, but which was begun over a hundred years ago. This tunnel, or adit as it should be more strictly termed, is at Schemnitz, in Hungary. Its construction was agreed upon in 1782, the object being to carry off the water from the Schemnitz mines to the lowest part of the Gran Valley. The work is now complete, and, according to the *Bauzeitung fur Ungarn*, it forms the longest tunnel in the world, being 10.27 miles long, or about one mile longer than St. Gothard, and 2½ miles longer than Mont Cenis. The height is 9 ft. 10 in. and the breadth 5 ft. 3 in. This tunnel, which has taken so long in making, has cost very nearly a million sterling, but the money appears to have been well spent; at least, the present generation has no reason to grumble; for the saving from being able to do away with water-raising appliances amounts to £15,000 a year. There is one further point, however, worth notice; for if we have the advantage of our great grandfathers in the matter of mechanical appliances, they certainly were better off in the price of labor. The original contract for the tunnel, made in 1872, was that it should be completed in thirty years and should cost £7 per yard run. For eleven years, the work was done at this price; but the French revolution enhanced the cost of labor and materials to such an extent that for thirty years little progress was made. For ten years following, much progress was made, and then the work dropped for twenty years more until the water threatened to drown the mines out altogether. Finally, the tunnel was completed in 1878, the remaining part costing £22 a yard, or more than three times as much as the original contract rate."

The longest tunnel in the world is the famous Rothschönberg Stollen or Adit in connection with the Himmelfahrt tunnel, which was already in operation when the Rothschönberg was connected with it. The whole length of the Rothschönberg as finally run, was 13,901 metres, starting from the Triebisch Valley at Rothschönberg, above Meissen, on the Elbe. The distance from Halsbrucke on the original location was 12,882 metres (42,266 ft. or 8 1/10 miles), and the depth reached below the Anna Stollen, the deepest previously existing, 94 metres (308 ft.). At the time of the final connection with Himmelfahrt, the tunnel and its branches together comprised a continuous completed length of nearly 29,000 metres (95,149 ft. or 18 miles). Additional branches are also projected, which will eventually make a complete length for the adit and branches of some 50,900 metres (166,003), or 31.6 English miles. This system effects the drainage of the Freiberg district, well known to many American mining engineers who have studied in the famous Saxon mining academy of that name.

The other mining tunnels in the world which are most notable for their length, are, the Ernst August in the Klausthal District of the Hartz Mountains, with 6⅕ miles, costing $427,500, and the Great Country adit in Cornwall, with 6 miles. The latter has a total tunnel length, including branches of over 30 miles, but six miles is the greatest continuous flow of water to reach daylight. The Röthschönberg had cost up to 1883 or '84 $1,896,670, or more than $50 a lineal yard.

He Got There First.

The mail carrier on the route between Milton and Clinton, a distance of 12 miles, is a darkey who walks. He makes the trip there and return every day except Sunday. The other day your correspondent interviewed him. "Pretty tight walk, eh?" Well, some time it's purty ha'd. Mos' gin'ly, though, I don' count de distunce." "There is a railroad running there now. Why don't you carry it on the train?" "Well, you see it's dis way: I done got de contrack fo' de ca'in de mail, an' less'n I give it up in de fus' place I don' spec to give it up twel de time's out. Den ag'in, I can't fo'd to wait on dat train. I done settin' down, res'in' at Clinton, 'fo' de train git dere."—*Atlanta Constitution.*

To Car Coupler Inventors.

It is a pity that so much good inventive talent should be wasted on car couplers when there is a crying want of improvement in many of the trials of daily life. The man who would invent a button that won't come off will go to his grave followed by the thanks of untold millions of unhappy bachelors, and even some married men will swell the chorus. Inventive minds can also find congenial occupation in effecting improvements in macaroni machinery, good red-lead pencils, type-writers that will work on account-books and record-books, indelible stamp canceling ink, an instrument for measuring the velocity of wind currents, apparatus for measuring the depth of the sea without sounding by line, piano-lid hinge which shall be flush on the outside, good fluid Indian ink for draftsmen, a method of alloying copper and iron and a molding material for iron and brass casting capable of giving a mold that can be used over and over again.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Camden & Atlantic, annual meeting, at the office in Camden, N. J., on Feb. 24.

Cleveland, Columbus, Cincinnati & Indianapolis, annual meeting, at the office in Cleveland, Ohio, on March 2.

Delaware, Lackawanna & Western, annual meeting, at the office in New York, Feb. 21.

Missouri Pacific, annual meeting, at the office in St. Louis, March 8.

Peoria, Decatur & Evansville, annual meeting, at the office in Peoria, Ill., March 1.

Brunswick & Western, annual meeting, at the office in Brunswick, Ga., March 9.

Atlanta & Charlotte Air Line, meeting, at the office, New York, March 9.

St. Louis, Iron Mountain & Southern, annual meeting, at the office in St. Louis, Mo., March 8.

New Orleans & Northeastern, annual meeting, at the office in New Orleans, La., March 7.

Norfolk Southern, annual meeting, at the office in Elizabeth N. C., on March 3.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New York State Passenger Association* will hold a meeting in New York on Feb. 24.

The *Southern Railway and Steamship Association* will hold a convention at the National Hotel, Washington, D. C., on Wednesday, March 2.

The *National Association of General Passenger and Ticket Agents* will hold its half-yearly convention in Washington, on Tuesday, March 15.

The *General Time Convention* will hold its spring meeting in New York City, on Wednesday, April 13.

The *Car Accountants' Association* will hold its annual convention in Atlanta, Ga., beginning on Tuesday, April 19.

The *Master Car-Builders' Club* holds its regular meetings at the rooms, No. 113 Liberty street, New York, on the third Thursday in each month.

The *New England Railroad Club* holds its regular meetings at its rooms in the Boston & Albany passenger station in Boston, on the second Wednesday of each month.

The *Western Railway Club* holds its regular meetings at its rooms in Chicago on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Delaware & Bound Brook, 2 per cent. quarterly, payable Feb. 16.

North Pennsylvania, 2 per cent., quarterly, payable Feb. 25.

Central Iowa Traffic Association.

The arbitrators of the Iowa pool have awarded the following percentages: Chicago, Rock Island & Pacific, 39½ per cent.; Chicago & Northwestern, 15 per cent.; Chicago, Burlington & Quincy, 15 per cent.; Wabash, St. Louis & Pacific, 15 per cent.; Chicago, Milwaukee & St. Paul, and Chicago, St. Paul & Kansas City's Melbourne route, 14 per cent.; Chicago, St. Paul & Kansas City and its connections, other than the Chicago, Milwaukee & St. Paul, 1½ per cent.

Rates on Grain from Elevators.

The Illinois Railroad and Warehouse Commission have refused the application of the Illinois Grain Merchants' Association that they permit the railroads to make a special rate one cent less per 100 lbs. for grain loaded into cars from elevators along the track than on shipments loaded from wagons. The Commission's refusal was on the ground that the special rate would be a discrimination against grain dealers and producers who do not own or control elevators.

Colorado-Utah Association.

Commissioner Midgley, of the Colorado-Utah Association, has given notice that, taking effect Feb. 15, the agreed through rates and divisions from points in Indiana, Michigan and Ohio, as shown in Colorado-Utah Tariff No. 1, will be withdrawn, with the exception of rates and divisions from Toledo and Detroit, which will be continued in effect.

Southern Railway and Steamship Association.

At a meeting of the Executive Committee of the above organization held in New York last week the probable effect of the Interstate Commerce bill was discussed without result. The committee consists of Virgil Powers, chairman; Charles A. Lindall, Secretary; Henry Fink, E. B. Thomas, H. Wallace, John B. Peck and E. P. Alexander; and the Secretary says that hardly any two of them appear to have exactly the same opinion about the working of the new bill. They adjourned to meet at Washington in March.

The Executive Committee directed the Rate Committee to make a complete revision of the present freight tariff, in order to see how it conflicts with the regulations of the bill; and also to report recommendations to harmonize the two. An informal meeting of the Rate Committee took place, but owing to the non-arrival of some western members no business could be transacted, and the committee adjourned to meet at Atlanta, Ga., on 16th inst.

Southwestern Railway Association.

The General Freight Agents of the Southwestern Railway Association lines met in Chicago this week for the purpose of adjusting the through and local tariffs to correspond with the provisions of the Interstate Commerce law. This is the first meeting of the kind yet held by any of the railway associations, and the members made a beginning with west-bound rates from Chicago and St. Louis to the Missouri River. It was practically agreed that the through rates on the several classes, as now in force, should stand, it being found that only in a few instances would the local rates have to be reduced in order that no higher rate should be charged for the shorter than the longer haul.

Middle States Freight Traffic Association.

A meeting of the Middle States Freight Association was held at Commissioner Fink's office on Feb. 15. The adjustment of local tariffs was the main subject under consideration.

The Omaha Railroad Club.

An adjourned meeting was held at Omaha on Feb. 5 for the purpose of taking action in the organization of a railroad club. There is already a Union Pacific Library Association at Omaha, and it was proposed to consolidate with that organization under the name of the "Union Pacific Railway Club and Library Association," and a committee was appointed to confer with the Library Association with a view of accomplishing the consolidation. The meeting then adjourned until Feb. 12, when the committee will report, and constitution and by-laws will be presented for adoption. The prospects are that an organization will be effected at this meeting and that the club will soon be holding regular monthly meetings.

The Freight Brake Trials.

As announced in these columns last week, some elaborate freight brake trials will be held at Burlington, Iowa, on the Chicago, Burlington & Quincy tracks in May next. In giving a list of the rules governing the tests and enumerating the tests, Rule 13 was unavoidably omitted and is given below:

"13. The rapidity with which the train gets away after a stop will be noted, the time being taken from stop to start. In case breakages or causes foreign to the brake interfere with getting away, the record will be thrown out."

The shocks during the stops will be measured by the movement of the "slidometer," a 16 lbs. turned iron weight free to slide in a planed pine trough placed horizontally in the way car at the rear of the train. A movement of more than 12 inches will be considered objectionable, as indicating a shock violent enough to injure stock."

Tests 6 and 7, which relate to trains breaking away and the frictional resistance of the cars, are special tests, and are therefore optional.

We also omitted to state that Mr. F. S. Wood, of the Chicago, Burlington & Quincy acted as secretary to the joint meeting of the Freight Train Brake Committee and the representatives, and that Mr. W. H. Ward was present on behalf of the Ward automatic brake.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Sante Fe.—Mr. Herbert Hackney has been appointed Assistant Superintendent of Machinery, with headquarters at Topeka, Kan.

Avon, Geneseo & Mt. Morris.—The following have been elected directors of this company: M. F. Reynolds, G. Ellwanger, L. F. Ward, J. Anstice, G. W. Phelps, H. P. Mills H. E. Brown. Inspectors: G. H. Harris, N. Seymour. Officers: President, M. F. Reynolds; Secretary, G. W. Phelps. The road is a leased line of the New York, Lake Erie & Western.

Blue Springs, Orange City & Atlantic.—Of this Florida company J. E. Thwing, of Minneapolis, Minn., is President; Dexter Hunter, Orange City, Fla., Receiver; S. B. Carter, Orange City, General Superintendent; W. A. Hawkins, of Orange City, is Freight and Ticket Agent of the road.

Chicago & Atlantic.—Mr. C. L. Mayne is appointed Train Master of this line, with office at Chicago. The position is a new one.

Chicago, Peoria & St. Louis.—The directors of this company, whose road is made up of leased branches of the Wabash, St. Louis & Pacific system, are William S. Hook, John A. Ayers, Charles S. Ramelle, Marcus Hook and Edward L. McDonald, all of Jacksonville, Ill.

Chicago, Rock Island & Pacific.—Mr. P. E. Dombaugh has been appointed Traveling Passenger Agent of this road at Columbus, O., to succeed Mr. Perry, resigned.

Cleveland, Columbus, Cincinnati & Indianapolis.—Mr. D. B. Martin has been appointed General Passenger Agent of this road in place of Mr. A. J. Smith, resigned.

Crookston Southwestern.—The incorporators of this Minnesota Company are: Alex. McKinnon, Delos Jacobus, R. B. Gates, C. C. Utzinger, M. Ericsson, Joseph Lawrence, August Waller, B. Clements, Robert Hunslow, John C. Hueler, Christian O. Christianson, A. G. Galloseh, John R. McKinnon, August Wortzel, John Lockren, E. M. Wile, H. M. Pierce, Felix Foevenet, W. D. Hurlburt, A. D. Stephens, S. F. Markham, G. M. Barber, A. C. Cowing, H. J. Hanscome, C. E. Sawyer, Isadore Fortser, August Walters.

Galveston, Sabine & St. Louis.—Richard J. Evans, General Manager of this road, gives information of the appointments of Frank McLarchar as Auditor; C. W. Booth, General Freight and Passenger Agent; W. W. Wood, Right of Way Agent; R. M. Evans, Supervisor of Roadway.

Richard J. Evans, Vice-President and General Manager of this road, has been appointed Receiver of the same, in place of Judge John M. Duncan, resigned.

Indianapolis & St. Louis.—At the election held in Indianapolis the following directors were chosen: Stephenson Burke, T. P. Handy, James Barnett, Amos Townsend, George H. Russell, H. H. Poppleton, of Cleveland, and John

T. Dye, of Indianapolis. Mr. Poppleton succeeds Mr. Devereaux, deceased; otherwise there are no changes in the directory. Of 6,000 shares of stock, 4,389 were cast for the above named.

Los Angeles & Santa Monica.—At the annual meeting of this company, held in Los Angeles, the following officers were elected: R. F. Lotspeich, President; S. B. Northcult, Vice-President; —— Rees, Secretary; M. L. Wicks, Treasurer.

Lynchburg Trust & Construction Co.—This company will build the Lynchburg, Halifax & North Carolina Railroad. Its incorporators are: G. N. Palmer, of Saltville, Va., W. H. Otey, C. De Witt, John Kelley, C. D. Langhorne and others.

Minneapolis, Sault Ste. Marie & Atlantic.—Mr. H. W. Hamilton has been appointed Superintendent of Transportation for this road with office at Turtle Lake, Wis.

New York, Lake Erie & Western.—Mr. R. H. Soule has been appointed General Manager of this road and its leased lines, with headquarters at 21 Cortlandt street, New York. Mr. John W. Cloud succeeds to Mr. Soule's former position, Superintendent of Motive Power of this road, with headquarters at Buffalo, N. Y. The appointments went into effect on Feb. 15. Mr. Ross Kells will be assistant to John W. Cloud; Mr. Tucker, now Superintendent of the Western division of the New York, Pennsylvania & Ohio, will succeed Mr. D. H. Blackam as Superintendent of the Susquehanna division. Mr. Bartlett, now Superintendent of the Rochester division, succeeds to Mr. Tucker's old position, and Mr. W. H. Starr, Roadmaster of the Eastern division, will take the place lef vacant by Mr. Bartlett.

New York, Pennsylvania & Ohio.—Mr. Ross Kells has been appointed Assistant Superintendent of Motive Power, with office at Cleveland, O.

Northern Central.—M. M. Shannon has been appointed Chief Train Dispatcher at Elmira, N. Y., the position lately held by Solomon Jones, deceased.

Ohio & Mississippi.—Mr. Edward P. Cutter has been appointed Secretary of this company, vice W. M. Walton, resigned. He will retain his position as Auditor, and his headquarters are at Cincinnati, O.

Mr. C. G. Jones is appointed District Passenger Agent of this company, with office at Vincennes, Ind.

Ohio Railroad Commission.—Mr. William Cappeller has been appointed Railroad Commissioner of Ohio by Governor Foraker, to succeed Commissioner Apthorp.

Philadelphia & Erie.—At the annual meeting, in Philadelphia this week the following directors were elected: W. Hasell Wilson, J. N. Du Barry, Wistar Morris, Samuel Gustine Thompson, John P. Wetherill, N. Parker Shortridge, Henry D. Welsh, Wm. J. Howard, Wm. L. Elkins and Edmund Smith.

Pittsburgh, Chicago & Missouri River.—The incorporators and directors are: Wm. G. Witherell, W. W. Dearmond, Allen C. Knapp, Mark Houser and Fred M. Atkinson, all of Chicago.

Richmond & West Point Terminal.—George S. Scott, Calvin I. Brice and Samuel Thomas have been elected directors of this company.

Roadmasters' Association of America.—Mr. H. W. Reed, Roadmaster of the Savannah, Florida & Western at Way Cross, Ga., has been appointed Secretary pro tem. of this association. Mr. D. H. Lovell, the Secretary, is unable to assume the duties of the office on account of ill health.

Summit Branch.—The following men have been elected directors of this company: George B. Roberts, A. J. Cassatt, Edmund Smith, Wistar Morris, N. P. Shortridge, J. N. Du Barry, John P. Green, William J. Howard and W. H. West.

Terre Haute & Peoria.—Manager Conklin has made the following appointments: General Freight and Ticket Agent, Andrew Stevens; Cashier, Edward A. West; Auditor, Walter M. Strange; Master of Transportation, O. E. Grady.

Union Line.—Mr. C. H. Riggs has been appointed General Agent at Pittsburgh, Pa., vice Mr. Wm. O. H. Scully, resigned.

Union Pacific.—President Cleveland has appointed Judge A. C. Haskell, of Columbia, S. C., to be Government Director of this company, vice E. P. Alexander, resigned. Judge Haskell is now President of the Charlotte, Columbia & Augusta and Columbia & Greenville Railroads, and is also President of the Loan and Exchange Bank of South Carolina.

Virginia Western.—At a meeting held at the Natural Bridge, Va., last week, the following directors were elected: A. S. Buford, John P. Branch, A. L. Boulware, T. C. Leake, Jr., Richmond; H. C. Parsons, J. H. D. Ross, Edward Dillon, Rockbridge county; Warner Miller, George West, New York; Wharton Barker, Philadelphia; De C. W. Thom, Reuben Foster, Baltimore.

At a meeting in Richmond, Va., Col., A. S. Buford was elected President and W. T. Townes appointed Secretary and Treasurer.

West Shore.—Mr. Charles E. Lambert has been appointed General Passenger Agent of this road, succeeding Mr. Henry Monett, whose promotion to the position of General Passenger Agent on the New York Central & Hudson River has been recorded. Mr. Lambert has heretofore been the Western Passenger Agent of the West Shore, with office at Chicago.

Mr. J. B. Jagor, Traveling Passenger Agent of the New York Central & Hudson River road, is to be appointed General Eastern Passenger Agent of the West Shore.

PERSONAL.

—President Newell, of the Lake Shore & Michigan Southern, is on a short trip to the Bermudas.

—Assistant General Passenger Agent Chears, of the Richmond & Danville, has resigned, and the office which he held has been abolished.

—Chauncey M. Depew, of the New York Central & Hudson River, has offered a prize of $500 for the best device for heating cars without stoves.

—Judge A. C. Haskell, the newly appointed Government Director of the Union Pacific, was a colonel in the Confederate army, and was badly wounded.

—Mr. William H. Stevenson has resigned the position of Superintendent of the New York New Haven & Hartford's New York Division, an office which he had filled for nearly five years.

—Mr. Henry C. Bixby, formerly Paymaster of the Worcester division of the Boston & Albany road, and afterwards Paymaster of the Atchison, Topeka & Sante Fe, died in San Diego, Cal., last week. He was a native of Boston, Mass.

—Mr. W. P. Sequive has left Messrs. Gardner & Co. manufacturers of car seats, etc., to associate himself with the firm of Frost & Peterson, who are fitting up an extensive establishment at 161 West 18th street, New York. Mr. Seguine has been with Gardner & Co., for the past 15 years.

—Mr. Ross Kells, who has just been appointed Assistant Superintendent of motive power of the New York, Lake Erie & Western, will have charge of the leased New York, Pennsylvania & Ohio, on which there are shops at four division headquarters. Mr. Kells was formerly on the Pennsylvania system whence he went in 1883 to the New York, Chicago & St. Louis, as superintendent of motive power. Later he was on the New York & New England road, and at Cleveland as general superintendent of the Paige Car Wheel Co.

—Mr. John W. Cloud, who succeeds Mr. R. H. Soule as Superintendent of Motive Power of the New York, Lake Erie & Western, is 36 years old, and after graduating at the Lawrence Scientific School of Harvard University in 1872, began his railroad career in the office of the General Manager of the Empire line at Williamsport, Pa. He soon went into the motive power department under Mr. Theodore N. Ely, and when the latter went to Altoona in 1874 accompanied him there and organized the Pennsylvania's testing department, which was the pioneer institution of the kind in this country. In April, 1886, on the death of Mr. J. B. Collin, he became mechanical engineer of the Pennsylvania road at Altoona where his office is probably the largest institution of the kind in America, having charge of all the plans, etc., of the immense shops of the road at that point.

—Judge Thomas Russell, whose death occurred in Boston, Mass., on Feb. 9, was a man whose brilliant and honorable career entitle him to the most sincere encomiums. Everything he did was done well, and wherever he served, the hand of a master and the zeal of a true man were always apparent. He was born in Plymouth, Mass., in 1825, was graduated from Harvard College in the class of '45, after which he took the Harvard law course. He became a member of the Suffolk bar, was made Judge of the Police Court in Boston, and then was promoted to a justiceship in the Superior Court, where he remained till 1866. The next year Judge Russell was appointed Collector of Customs of the Port of Boston by President Johnson, and held that office until 1873, when he resigned. In 1874 he was made United States Minister to Venezuela by President Grant, and this post he retained until 1878. In June, 1879, Governor Talbot appointed Judge Russell Railroad Commissioner to succeed Charles Francis Adams, and he served as chairman of the board up to the time of his death. For many years he was an overseer of Harvard College, a Trustee of the Massachusetts Reform School, and during the war was one of the Draft Commissioners.

—Mr. R. H. Soule, the new General Manager of the New York, Lake Erie & Western, has had a varied experience in his comparatively short railroad career, having held a half-dozen important positions on the Pennsylvania roads before he went to the West Shore in 1883, and the Erie directors cannot have gone wrong in concluding, after their experience with him for the past year, that he has the right combination of qualities for a successful general manager, having graduated from Harvard College, and thus been furnished with a scientific ground work for his practical experience since beginning his railroad career.

Mr. Soule was born in Boston, in 1849, and began his railroad life in the mechanical engineer's office of the Pennsylvania road at Altoona in 1875. In 1876, he took charge of the introduction of the interlocking system provided by the Pennsylvania road at Philadelphia for the enormous business of the Centennial exhibition of that year; the following year he gave in the *Railroad Gazette* a full account of this system, which was the first of its kind on any considerable scale in this country. In 1877, Mr. Soule was in the testing department at Altoona, and during the next six years took charge of the Pennsylvania's motive power department successively at Baltimore, Williamsport and Columbus. From the latter place he went to the Superintendency of the West Shore motive power department in June, 1883, and thence to the same position on the Erie in December, 1885.

TRAFFIC AND EARNINGS.

Coal.

Coal tonnages for the week ending Feb. 5 are reported as follows:

	1887.	1886.	Inc. or Dec.	P.c.
Anthracite	524,911	552 541	D. 27,630	5.0
Eastern bituminous	285,068	218.956	I. 64,112	30.2
Coke	93,418	24,956	I. 68,462	273.5

The coal handlers' strike at the tidewater shipping points is practically at an end, and all the companies are delivering coal freely, both New York local and shipping coal.

Cumberland coal shipments for the week ending Feb. 12 were 69,005 tons; total to Feb. 12 this year, 298,829; last year, 225,573; increase, 73,256 tons, or 32.4 per cent.

Pennsylvania Railroad coal tonnage for the week ending Feb. 5 was:

	Coal.	Coke.	Total.	1886.
Line of road	161.714	91,509	253,223	177,576
From other lines	78,932	1,909	80,841	91,602
Total	240.646	93,418	334,064	269,178
Year to Feb. 5	1,276 290	444,965	1,721,255	1,380,750

Increase for the week, 64,886 tons, or 24.4 per cent.; increase for the year, 340,505 tons, or 24.7 per cent.

Pennsylvania Railroad Coal Tonnage.

The coal tonnage of the Pennsylvania Railroad Division of the Pennsylvania Railroad for the year ending Dec. 31, 1886, as given in detail by the company's statement, was as follows, in tons of 2,000 lbs.:

Originating on the line of Pennsylvania Railroad Division:

Semi-bituminous:	Coal.	Coke.	Total.
Snow Shoe	113.967	29,036	143,003
Karthaus	154,086	.....	154,086
Tyrone & Clearfield	2,273.147	024	2,273,171
Gallitzin & Mountain	672,564	201,868	874.432
West Pennsylvania Railroad	318,493	110.168	428,661
Southwest Pennsylvania	158,185	2,715,895	2.874,080
Westmoreland Region	1,305,732	339,965	1,645,697
Monongahela "	414,611	152,061	566,672
Pittsburgh "	276,671	628	279,299
Anthracite:			
North & West Branch	1,388,340	.....	1,388,340
Sunbury, Hazleton & Wilkesbarre Railroad	359.384	.....	359,384
Other points	9,451	.....	9,451
Total	7,446,631	3,549,645	10,996,276
Originating off the line of Pennsylvania Railroad Division:			
Anthracite	2,965,124	.....	2,965,124
Semi-bituminous	1,327,740	70,466	1,398,206
Total for year 1886	11,739,495	3,620,111	15,359,606

The total tonnage for the year was thus divided as follows: Anthracite, 30.7 per cent.; bituminous, 45.7 per cent.; coke, 23.6 per cent. Of the total tonnage of all kinds 71.6 per cent. originated on the line of the road and 28.4 per cent. came from connecting lines.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of January:

	1887.	1886.	Inc. or Dec.	P. c.
Atch., T. & S. F.	$1,286.157	$862,203	I. $423,954	49.1
Buff., N. Y. & P.	183,600	169.813	I. 13,787	8.1
Bur., C. R. & No.	220,208	177,563	I. 4,899	2.7
California South.	117,479	26 664	I. 90.815	340.5
Cape F. & Y. Vy.	20 533	17 922	I. 2,611	14.5
Ches. & Ohio	317,612	261,169	I. 56.443	21.6
Eliz., Lex. & B. S.	69,130	59,278	I. 9,852	16.6
Ches., O. & S. W.	140.168	117,266	I. 22,902	19.4
Cin., R. & Ft. W.	26.754	23,798	I. 2,956	12.4
Cin., W. & Balt.	182,993	144.522	I. 38,471	26.4
Cleve., Ak. & Col.	36,760	32,637	I. 4,123	12.6
Cl., C., C., & I.	281,347	273,239	I. 8,108	2.9
Col. & Cin. Mid.	28,464	22,104	I. 6,360	28 7
Col., H.Vy. & Tol.	209,756	164,982	I. 44.774	27.1
E. Ten., Va. & G.	409,867	324,032	I. 85,835	26.4
Flint & P. M.	171,305	152,094	I. 19,301	12.6
Ft. Worth & D.	37.345	24,484	I. 12,861	52.4
Grand Rap. & I.	141,234	116,734	I. 24,500	20.9
Grand Trunk	1,100,446	1 011,637	I. 88,809	7.7
Gulf, Col. & S. F.	189,081	154,223	I. 34,858	22.6
Hous. & Tex. C.	218,584	207,918	I. 10.666	5.1
Ind., Bloom. & W.	202,600	178 763	I. 23,837	10
K. C., Clint. & S.	16.849	14,521	I. 2,328	16
Lehigh & Hudson.	20.926	16,759	I. 4,167	24
Louisv. & Nashv.	1,227,670	1,050,686	I. 176,984	16.8
Lou., N. A. & C.	137.379	115,780	I. 21,599	18
Mem. & Charles.	155,849	115,167	I. 40.682	35
Minn. & N. W.	64,068	12,176	I. 51.892	425
N. Y. Cen. & H. R.	2,714,710	2,295,095	I. 419.615	18
N. Y. City & No.	43,356	36,840	I. 6.516	17.7
N. Y., Ont. & W.	84,808	78.107	I. 6,701	8 5
Ohio Southern.	53,476	44,790	I. 8,686	19.3
Oreg. R. & N.	274,225	234,618	I. 39,607	16.8
Rich. & Danville.	607 575	527,982	I. 79.593	15.0
St. P., Min. & M.	459.250	405,538	I. 53,711	13.2
Staten Island.	40.804	35,854	I. 4,950	12.7
Valley (Ohio)	45,016	37,786	I. 7,230	19.1
Wab., St. L. & P.	428,371	350,807	I. 77,564	22.1
Wheeling & L. E.	50,482	40,344	I. 10,138	25.1
Min., S. C. & W.	30,010	12,823	I. 17,187	134.1
Wis & Minn.	48,600	11,560	I. 37,040	319.3

Year ending Dec. 31:

	1886.	1885.		
C., I., St. L. & C.	$2,601,662	$2,373,467	I. $228,195	9.6
Net earnings	1,002,143	869,328	I. 132,815	15.3
E. Ten., Va. & G.	4,283,212	4,120,437	I. 162,775	3.9
Net earnings	1,575,404	1,414,556	I. 160.848	11.4
L. Rock & Ft. S.	723,348	614 288	I. 109,060	17.7
Union Pacific	26,603,797	25.606.675	I. 997,122	4.0
Net earnings	8,995,178	9 687.441	D. 692,263	7.2

Month of December.

Cairo, V. & C.	$63,269	$48,714	I. $14.555	29.5
Net earnings	12,815	5,713	I. 7,102	124.6
C., I., St. L. & C.	246,976	205,706	I. 41,270	20.1
Net earnings	94,912	76,590	I. 18.322	23.8
East T., Va. & Ga.	420,619	408,554	I. 12,065	2.9
Net earnings	190,793	195,643	D. 4,849	2.4
L. Rock & Ft. S.	96.524	72.820	I. 23,704	32.4
N. Y., Ont. & W.	98,555	139,684	D. 41,129	29.4
Net earnings	2,858	*10,475	I. 13,333	....
Oregon Imp. Co.	264,469	211,094	I. 53,375	25.3
Net earnings	44 494	29,472	I. 15,022	51.7
Union Pacific	2,343.543	2,303.118	I. 40 425	1.7
Net earnings	833,427	881,602	D. 48,175	5.5

* Deficit.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Cotton.

Cotton movement for the week ending Feb. 11 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c.
Receipts	55.048	49,597	I. 5,451	10.9
Shipments	58.862	64,494	D. 5.632	8.7
Stock, Feb. 11	332,798	454,116	D. 121,318	29.0
Seaports:				
Receipts	108,257	105,792	I. 2,465	2.3
Exports	113,802	104,960	I. 8,842	8.4
Stock, Feb. 11	891,495	1,044,762	D. 153,267	14.7

The total movement from plantations for the crop year to Feb. 11 was 5,656,597 bales, against 5,502,921 last year, 5,110,706 in 1884–85, and 5,012,302 in 1883–84.

Chicago Through Shipments Eastward.

Shipments of dead freight from Chicago for the week endnding Feb. 12 are given by the Board of Trade report as follows:

	Tons.	P. c.		Tons.	P.c.
Chi. & Gd. Trunk	5,015	10.0	Pitts., Ft. W. & C.	9,097	18.3
Mich. Central	5,776	11.5	Chi., St. L. & Pitts.	5 007	10.0
Lake Shore	11,712	23.5	Balt. & Ohio	3,846	7.6
N. Y., Chi. & St. L.	6.654	13.3	C., Ind., St. L. & C.	2 912	5.8

The total for the week was 50,019 tons. The total shipments for eight weeks by these reports have been as follows:

Week ending—							
Dec. 25.	Jan. 1.	Jan. 8.	Jan. 15.	Jan. 22.	Jan. 29.	Feb. 5.	Feb. 12.
63,133	44,292	37,520	44,017	36,972	.....	.. ...	50,019

The Chicago & Atlantic shipments are not reported, and are not included above.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—The management of this road issued its circular in Boston this week regarding new rights in the stock of the Chicago, Kansas & Western, under whose charter the former company will build 450 miles of road in Kansas, and also in the stock of other roads which are to be assisted in extending their lines in Colorado and California. The Atchison, Topeka & Santa Fe will own the capital stock of all these collateral properties, less the amount issued for local aid. The total amount required for all these projects is estimated at about $13,000,000, of which about one-half will be needed for the Kansas lines, and subscriptions are invited from the Atchison's stockholders in the proportion of one block for each 100 shares of Atchison stock standing in their names at the close of business Feb. 21, 1887, and rights may be assigned.

That the smaller stockholders may not be excluded, subscriptions may also be made for one-tenth of a block, and for multiples thereof.

Baltimore & Ohio.—The new equipment to be purchased by this company will consist of 5 baggage cars, 500 hopper gondolas, 2,356 box cars, 10 parlor cars, 15 buffet sleepers, 10 sleeping cars, 30 passenger cars, 55 Mogul engines and 20 passenger engines.

This company is buying up property on the north side of Filbert street, between Broad and Twenty-second streets, in Philadelphia.

The scheme has progressed so far that plans and maps have been drawn for the proposed improvement. The Baltimore & Ohio now runs along the east bank of the Schuylkill River, much below the grade of the streets and passes under the Pennsylvania elevated tracks. In order to get the necessary elevation the new branch to run down to Broad and Filbert streets will leave the main track near Callowhill street, swing round, mostly passing over open lots until it reaches Twenty-second and Filbert streets, when it will have attained the same elevation as the Pennsylvania viaduct.

Blue Springs, Orange City & Atlantic.—Tracklaying will be completed from Orange City, Fla., to New Smyrna, about March 1, making 20 miles of new road built since Dec. 1, 1886. The road is being completed by Receiver Hunter, under the direction of S. B. Carter, Superintendent and Engineer, late Chief Engineer of the Jacksonville, Tampa & Key West.

Boston & Albany.—The new passenger station at Chatham, N. Y., will be a structure of 100 ft. by 35 ft., built of granite, with brownstone trimmings. The interior will be very complete and of oak finish. The architects are Shipley, Rutan & Coolidge, of Brookline, Mass., and the contract for building is let to J. E. McClure, of Hudson, N. Y.

The statement as submitted to the State Railroad Commission for the quarter ended Dec. 31 is as follows:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$2,196,143	$2,136,147	I. $59,996	2.3
Expenses	1,513,394	1,382,238	I. 131,156	9.4
Net earnings	$682,749	$753,909	D. $71,160	9 4
Charges	625,032	586 709	I. 38,323	6.5
Net income	$57,717	$167,200	D. $109,483	65.4

For the quarter the gross earnings show an increase of $59,996, or 2.3 per cent., and the expenses $131,156, or 9.4, making a loss of $71,160, or 9.4 per cent.

Boston, Hoosac Tunnel & Western.—The statement for the quarter ended Dec. 31, as submitted to the State Railroad Commission, is as follows:

	1886	1885.	Inc. or Dec.	P.c.
Earnings	187 191	153.862	I. 33,329	21.6
Expenses	117.9 0	116.474	I. 1,456	1.2
Net earnings	69,261	37,388	I. 31,873	85.2
Charges	28.000	.....	.....	....
Net income	41,261	.....	.....	....

The quarter shows a gain in the gross earnings of 21.6 per cent. and in the expenses of only 1.2 per cent., thus leaving a gain of 85.2 per cent. in the net earnings.

Boston & Maine.—The principal portion of the bill that will be reported to the Maine Legislature, authorizing this company to acquire and purchase the roads and franchises of railroad corporations in that state, reads as follows:

"The Boston & Maine Railroad is authorized to acquire by purchase the road, franchises and property of the Eastern Railroad Co., and after such acquisition and purchase may also acquire by purchase the road's franchises and properties of any railroad corporations whose roads are operated in Massachusetts or New Hampshire, either by it or by said Eastern Railroad Co., under lease, contract or through ownership of stock; and also of the following railroad corporations in the state of Maine, namely: The Portland, Saco & Portsmouth Railroad Co., the Portland & Rochester Railroad, the Portsmouth, Great Falls & Conway Railroad Co., the Kennebunk & Kennebunkport Railroad Co. and the Orchard Beach Railroad Co. The purchases herein authorized, and each of them, shall be made on such terms and conditions as may be agreed to by the purchasing and selling corporation, and as shall be approved, at meetings called for the purpose, by the votes of a majority in interest of the stockholders of the purchasing corporation, and of the stockholders of the selling corporation other than said Boston & Maine Railroad, and said Eastern Railroad Company and stockholders holding stock for the benefit of either of them."

The Maine Central road is not mentioned in the bill.

This company will build an iron bridge over Back River at Amesbury, Mass.

Brooklyn Bridge.—A bill has been prepared by the trustees of the New York & Brooklyn Bridge, the main section of which reads as follows:

"The trustees of the New York & Brooklyn Bridge are authorized to extend and operate the railroad over the bridge, over, along and upon the footpath across Centre street, in the city of New York, to the westerly line or side of said street, and to make the changes in and additions to the footpath necessary for the uses of the railroad. There shall be a footpath on each side of the railroad, but the whole structure over and across Centre street shall not be made wider than the platform over Park Row."

The bill is to be forwarded to the Legislature of New York.

Buffalo, Rochester & Pittsburgh.—An agreement has been filed in Rochester, N. Y., by which Frederick D. Tappen, as lessor and trustee of holders of car trust certificates, agrees to lease, for 23 years, rolling stock to this company, consisting of 50 locomotives, 2,850 cars of different kinds, 10 passenger coaches, and 2 steam shovels. The total value is $1,500,000, of which $300,000 is to be paid to Mr. Tappen on the delivery of the rolling stock, and from 1890 until 1909 $60,000 is to be paid each year, the rolling stock then to become the property of the railroad company.

Canton, Burlington & Northern.—This is the name of a proposed new road of 11 miles in Dakota. Capital Stock, $800,000.

Central Iowa.—A committee has been appointed to formulate a plan for the reorganization of this company. Mr. Elijah Smith, who owns and represents a large amount of the bonds secured by first mortgage upon the main line, announces his desire to hear from other main line bondholders who are willing to join with him in a plan to protect their interests in any reorganization proceedings, or at the foreclosure sale which may take place in connection with pending litigation.

Central Mexico.—This newly organized company will build the Guadajara and Tampico branches of the Mexican Central. The stock of the new company will be held by trustees, and ultimately changed for the stock and incomes of the Mexican Central. The new company also has power to buy railroads and telegraphs in Mexico, and the stock and bonds of Mexican railroad and telegraph companies.

Central, of New Brunswick.—The grading and bridge building on this road are being proceeded with near Norton, Kings County, N. B. Steel rails for 82 miles of road, and the necessary cars and locomotives have been contracted for. The grading is about all let, sleepers and feacing given out, and the bridge work is under contract. It is likely that the road will be finished next autumn.

Central Pacific.—On Feb. 8 passenger trains on the Oregon Division began to run to Montague, Cal., the Yreka station. The new terminus is 22 miles north of Edgewood, the late terminus. There are 34 miles of track still to be laid to reach the Oregon line, and 48 miles to complete the connection with the Oregon & California road at Ashland.

A serious snow blockade now exists on this line between Colfax and Cisco, Cal. The trains are stalled, and no efforts can get them out of the drifts. One engine was thrown from the track on Feb. 14, and buried in a huge snow drift.

Charleston, Cincinnati & Chicago.—This company has executed a mortgage in favor of the Boston Safe Deposit Co. which provides that bonds equal to $20,000 per mile on its whole line may be issued. The Massachusetts & Southern Construction Co., R. R. Johnson, General Manager, and Jno. F. Jones Chief Engineer and Superintendent of Construction, has a contract for the whole line, which is expected to extend ultimately to Chicago.

At present the completed line comprises the Chattaroi Railroad from Ashland to Richardson, Kentucky, 50 miles, and another piece of 50 miles from Blacks, S. C., to Rutherfordton, N. C.

It is hoped to complete a connection with Charleston within the next 12 months. The company has in view a direct connection between Charleston and Chicago, passing through a fine forest country, and it relies upon a heavy traffic in coal, iron, marble and other stone reported to be available, also upon bringing to market the products of a rich agricultural country and upon opening up health resorts.

The road is laid with 60½-lb. rail, on 2,900 ties per mile. The Chief Engineer may be addressed at Shelby, N. C.

Chicago, Burlington & Northern.—The following stations on the line of this road have been opened as regular billing stations, viz.: East Winona, Wis., with R. M. J. Glynn as Agent; Grand Crossing, Wis., with S. E. Dana as Agent. Grand Crossing is three miles north of La Crosse. Tariff rates for La Crosse will apply for Grand Crossing.

Chicago, Burlington & Quincy.—The Iowa Railroad Commissioners have decided a case against this company where complaint was made that higher rates were charged from Iowa points to Greenwood, Ia., than to Council Bluffs, a greater distance. The board held that the principle of the Interstate bill relative to long and short hauls should apply to points within the state, and to charge more for shorter than long distances is extortion.

Chicago, Kansas & Nebraska.—This road has been extended from Hebron, Neb., west to Nelson, 30 miles.

Chicago, Milwaukee & St. Paul.—General Passenger Agent Carpenter has sent the following circular to all passenger agents: "The Inter-state Commerce law, which goes into effect on March 31, 1887, forbids the issue of passes or the making of reduced rates to other than bona fide railroad employés (except as noted below). Therefore, from this date you will not issue nor recommend the issue of annual, season, trip or mileage passes or half-fare permits to any person, on any account, who does not come under the head of railroad employés (except as noted below), for any period beyond March 31, 1887." This cuts off families of railroad employés also newspaper men, hotel and theatrical people, etc.

Tracklaying is completed from Gault, Mo., south to Chillicothe, about 28 miles, of which 20 miles have been laid since Jan. 1.

Chicago, Peoria & St. Louis.—A syndicate has leased from Receiver Cooley the Peoria, Pekin & Jacksonville branch and the Springfield & Northwestern branch of the Wabash, St. Louis & Pacific system, and will operate these lines under the above name in connection with the Jacksonville & Southeastern Railroad and its new auxiliary, the Litchfield, Carrollton & Western. Capital stock, $2,000,000. Offices at Jacksonville, Ill.

Cincinnati, Indianapolis, St. Louis & Chicago.—President Ingalls asserts that the decision of the County Auditor that the stock of the road is taxable in Hamilton County, O., will be to change the ownership of the road. He says that Cincinnati men are getting rid of their stock to New York parties. "At the next annual meeting," Mr. Ingalls says, "there will be a change in the management of the road. New York men will take the places of several of the Cincinnati men in the board." President Ingalls intends to obtain a ruling in this matter from the Supreme Court.

Cincinnati, Washington & Baltimore.—This company has perfected its title to the Marietta & Cincinnati Railroad Co., by purchasing the interests of the city of Cincinnati on its mortgage of July 27, 1850, on the Hillsboro & Cincinnati Railroad for $100,000, and on the Marietta & Cincinnati for $150,000. The claims of the city, with accrued interest, aggregate $1,000,000, and have been prosecuted in the courts for 17 years, but by the agreement perfected final entries of judgment are made now perfecting the title of the Cincinnati, Washington & Baltimore to this property.

Columbus, Hocking Valley & Toledo.—An injunction suit has been filed by John W. Shaw, the recently elected President of this company, against the following ex-officers and holders of stock and other securities: Stevenson Burke, M. M. Greene, Charles Hickox, Charles G. Hickox, William J. McKinnie, Chauncey Andrews and John Wells and the Toledo & Ohio Central Railroad Co. The plaintiff seeks to restrain the defendants from selling any of the stock which they hold in the road and also to compel them to account for their alleged indebtedness to the company by reasons of the alleged appropriation of stocks and bonds which were believed to be missing. Judge Bingham granted the application for the restraining order and required the plaintiff to enter into a bond in the sum of $100,000 to secure the costs in the action.

Columbia & Puget Sound.—This railroad company's saw-mill is now cutting 4,500 cedar telegraph poles by an order from the Postal Telegraph Co. They are for shipment to San Francisco, and will aggregate 600,000 ft. of timber, requiring 6 weeks' time to cut.

Crookston Southwestern.—This company has been incorporated in Minnesota, and proposes to construct a line of road from a point on the Duluth & Manitoba road, at or near Fertile, Polk County, Minn., in a northwesterly direction via Crookston, to the east bank of the Red River, at a point near the boundary line between Polk and Marshall Counties. Capital stock $2,000,000.

Delaware & Hudson Canal.—Mr. T. M. Williamson is appointed Assistant Superintendent, in charge of the Saratoga and Champlain divisions; and Mr. P. H. Connors is appointed Assistant Superintendent, in charge of the Susquehanna division, both having headquarters at Albany, N. Y. The office of Train Master is abolished.

Denver Terminal.—This company has in prospect the building of a road across Colorado. From Denver to Georgetown the line is laid out parallel to the Colorado Central; thence via Berthoud Pass to Dillon, with divergent lines into Gunnison and Grand Counties. The main stem is to follow a line between Park range and Williams Mountains, crossing the Muddy River in Grand County, and running direct to Agency Park and Meeker. From this point, it traces White River through Garfield County, thence to Provo, Utah.

Dubuque & Sioux City.—The U. S. Circuit Court at New York has enjoined the defendants, in the suit of Woodruff against Drexel, Morgan & Co. and this company's directors, from voting at the next shareholders' meeting on certain shares which Woodruff deposited with Drexel, Morgan & Co., and on which he gave them a proxy under a circular issued by the railroad company in 1886. Woodruff demanded the return of his shares and revoked the proxy. Drexel, Morgan & Co. refused to return the shares. By the decision of the court those who have deposited their shares with Drexel, Morgan & Co. can withdraw them and revoke their proxies. As regards proxy voting in the Dubuque & Sioux City Co., the Court says this is a question that must be decided in Iowa.

The annual meeting of this company's stockholders was held at Dubuque, Ia., this week, and about 100 representatives of the Illinois Central were present. The Jessup faction was also represented, a member of the firm of Drexel, Morgan & Co., holders in trust of a majority of the stock, being present. The Illinois Central people carried the election of chairman, judges and directors, denying the claim of Judge Hubbard, attorney for the present Dubuque & Sioux City directory, that the majority of stockholders ruled. After the adjournment of the regular meeting the Jessup faction elected the old board of directors.

Duluth, South Shore & Atlantic.—The contractors for the Summit Division of this road's extension from Sturgeon, Mich., are F. C. O'Reilly & Co., of Philadelphia. The contract for the Western Division is let to Henry & Balch, of Minneapolis, Ind. Everything is now ready for the contractors' work.

Flint & Pere Marquette.—The complaint recently brought by the common stockholders of this road has been answered in an extensive document filed last week in Detroit, Mich. It admits that prior to the foreclosure the capital stock of the company consisted of $3,500,000. This was divided into 35,000 shares, but only 32,982 of these were sold or issued. The holders of the consolidated bonds, it was claimed, after foreclosure proceedings had been begun, agreed upon a Purchasing Committee that should arrange for the buying in of the property when it should be sold under foreclosure, unless the price was high enough to pay the holders the market value.

The total value of the property turned over to the Flint & Père Marquette Railroad Company by the Purchasing Committee did not exceed in value the $6,500,000 agreed upon as the amount of preferred stock. The reason that a contingent issue of $3,500,000 of common stock was provided for in the certificate of reorganization was because holders of some of the stock of the old company claimed that the value of the property would be determined by its earning capacity.

It is denied that the reorganization was accomplished illegally under the Michigan laws, and that the preferred stock was illegally issued. The statement that the holders of the preferred stock unlawfully combined together is denied, as is also the charge that information has been withheld regarding the accounts of the company. The accounts, it is claimed, have always been properly kept and the books have been open and could have been accessible to the complainants. It is also denied that improper amounts have been charged to operating expenses, larger than was sufficient for that purpose.

Gainesville, Henrietta & Northwest.—This company has filed an amendment to their charter at Austin, Tex., increasing the capital stock $6[illegible]0,000.

Havana, Rantoul & Eastern.—This road, extending from Le Roy, Ill., to West Lebanon, Ind., which was acquired by the Illinois Central Jan. 1, will be changed to standard gauge and laid with new rails as soon as the weather permits. A side extension of the road is likely to be built between Marysville and Danville, Ind.

Houston, East & West Texas.—The security holders of this company met in New York this week. The road has been in the hands of a Receiver, Mr. M. G. Howe, of Houston, Tex., for the past two years. It is 192 miles long, running from Houston, Tex., to Logansport, La., with a branch of 40 miles between Shreveport and Logansport, La. The recent meeting was called by the President of the company, Mr. E. L. Bremond. He proposed an issue of $1,500,000 first mortgage, $1,500,000 second mortgage, and $500,000 third income bonds, all bearing 5 per cent. interest. That $1,000,000 firsts be held in trust for the purpose of improvements, and $500,000 of the same be issued at once to pay off Receivers' debt, statutory liens, and to relay 40 miles of track. A committee will be appointed to examine and report upon the proposition.

Illinois Central.—This company has given a mortgage to the United States Trust Co., of New York, for $9,000,000 on its entire line. It is payable in London, July 1, 1950, to draw interest not exceeding 4 per cent. per annum. The mortgage is signed by James C. Clark, President, and W. J. Mariac Secretary. The document is to be recorded in all counties through which the road passes.

Indianapolis, Bloomington & Western.—This road will probably be bought by the following purchasing committee selected by the bondholders: Frederick P. Olcott, Francis A. French, John A. Farwell, Dumont E. Clarke, and J. Rogers Maxwell. New common stock, to the amount of $10,000,000, and $3,325,000 preferred stock will be issued. The reorganization scheme includes the consolidation of the Indiana, Bloomington & Western with the Cincinnati, Sandusky & Cleveland and the Columbus, Springfield & Cincinnati under the name of the Ciumbus, Indianapolis & Western. The general officers of the Indiana, Bloomington & Western will not be changed.

Kansas City, Wyandotte & Northwestern.—The track of this road is now completed to Menager Junction, Kan., 17 miles from Wyandotte. Regular trains are now running between the two points.

Kansas Valley.—The charter has been obtained for this road, to be built from Kansas City, Mo., to Denver, Col. It will run from Kansas City to Topeka, Kan., thence to Junction City, through the Fort Riley reservation to Abilene and Solomon City, and thence west to Denver. If built, the estimated cost of the road is $6,000,000.

Lake Erie & Western.—In the Federal Court at Indianapolis, Ind., last week, Judge Gresham ordered very material reduction in the allowances asked by Receiver Cheney and the attorney employed by him. The Receiver's claim for $10,000 per annum was reduced to $7,500. Two of his attorneys wanted $10,000, but were allowed only $3,500. The New York and Chicago lawyers asked for $20,000; they got $12,000. J. M. Lemon and J. S. High, as attorneys for the original plaintiffs in the case, demanded $14,000. Their entire claim was disallowed. The average reduction in the total amount of the claims was 60 per cent.

Lake Shore & Michigan Southern.—Suit for $32,280 damages has been brought by Vliet, Nutt & Co., oil refiners, of Cleveland, O., against this company. It is claimed that a discrimination in freight rates was made against them in favor of the Standard Oil Co., by charging them $3 a car more than the latter company was charged.

Maine Central.—The directors of this company have authorized the extension of the double track from Portland, Me., to Cumberland Junction, 7 miles distant. Work will begin in the spring.

Massachusetts Railroad Commission.—Governor Ames to-day nominated George G. Crocker, of Boston, for Railroad Commissioner to fill the vacancy caused by the death of ex-Judge Thomas Russell. The Executive Council suspended the rules and confirmed the appointment. Mr. Crocker is a graduate of Harvard in the class of 1864. He is

familiar with the railroad law, and has a thorough knowledge of the requirements of the place.

Manhattan.—The report of this company for the quarter ending Dec. 31 is as follows. It is interesting, as showing the effect of the reduction of fares from 10 to 5 cents:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$2,028,593	$1,818,199	I. $210,394	11.5
Expenses	1,126,285	922,709	I. 203,576	20.2
Net earnings	$902,308	$895,490	I. $6,818	0.7
Other income	17,445	17,357	I. 88	0.5
Total	$919,753	$912,847	I. $6,906	0.7
Charges	509,089	476,902	I. 32,187	6.7
Surplus	$410,664	$435,945	D. $25,281	5.7

From this statement it will be seen that the five cent fare plan resulted in a decrease of the surplus to the amount of $25,281 as compared with the corresponding quarter of last year, when the fare was ten cents. While the gross earnings show an increase of 11.5 per cent., the expenses were 22 per cent. greater. But this hardly indicates what may be expected from a continuance of the five cent fare. There is no likelihood of the plan being changed.

Michigan Central.—The extension to Gladwin, Mich., from the end of present Pinconning Division of this road is now in process of construction, the location being completed and the clearing and bridge work commenced. The length of extension is 20 miles. Charles A. Gatchell of Buffalo, N. Y., is the contractor. The surveys are completed and work nearly finished on the Vanderbilt Branch, which leaves the Mackinaw Division of the Michigan Central at Vanderbilt, Mich., and extends 10 miles into the woods. McRae & Lalley of Detroit, Mich., are the contractors for this extension. Mr. J. D. Hawks, Chief Engineer of the road, has charge of both sections of construction.

Minnesota & Northwestern.—It is announced from Chicago that President Stickney, of this company, has let contracts for $2,000,000 of rolling stock for Southwestern and other extensions of the road. The road now runs from St. Paul, Minn., to Lyle, Minn., with a 20 mile branch, making a total of 130 miles.

Missouri Pacific.—This company gives notice that the Leroy & Caney Valley Air Line road has been opened for business as far as Elk City, Kan., with the following stations, all in Kansas: Sexton, Fredonia, La Fontaine, Costello and Elk City. The Missouri Pacific operates the road, and takes business through without transfer.

Nashville, Chattanooga & St. Louis.—On the Huntsville extension of this road the line is located from Elora, Tenn., to Huntsville, Ala., a distance of 27 miles. The contract for construction is let to Holmes, Davis & Co., of Nashville, Tenn. Estimated cost $320,000. There are 600 ft. of iron bridge-work not yet let. R. C. Morris, Chief Engineer. Engineer in charge, Hunter McDonald.

On the Bon Air extension, from Sparta, Tenn., to the Bon Air coal mines, distance 6 miles, the contract work is let to Foster & Creighton, Nashville, Tenn. E. Pardou, engineer.

The contract on the Jasper Branch from Victoria, Tenn., to Whitwell Mines, is also let to Foster & Creighton. The length of this extension is 4 miles. Grading is nearly completed.

New York Arcade.—At a meeting held in New York this week, the question of giving out contracts without delay was discussed. The company must give a bond of $2,000,000 and must raise $3,000,000 before beginning work. A circular is to be sent to property owners on Broadway, who are opposed to the road, glorifying the scheme. The company claims that at present it costs as much to convey freight by wagon from one end of Manhattan Island to the other as it does to send it from New York to Liverpool.

New York Central & Hudson River.—The statement for the quarter ending Dec. 31 is as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Earnings	$9,021,256	$6,876,601	I. $2,144,655	31.1
Expenses	5,458,749	4,135,208	I. 1,323,541	32 0
Net earnings	$3,562,507	$2,741,393	I. $821,114	29.9
Charges	1,957,200	1,467,000	I. 490,200	33.4
Surplus	$1,605,307	$1,274,393	I. $330,914	25.9

From the surplus the usual dividend were paid, amounting to $894,283.

New York, Chicago & St. Louis.—The claims of Samuel Shethar and George J. McGourkey, trustees for the equipment bondholders, have been settled for $3,443,968, the original claim being for $4,000,000. A written agreement between the company and Messrs. Shethar & McGourkey, trustees, was submitted this week to Judge Hamilton, in the Common Pleas Court, at Cleveland, O. The contract was approved, and the settlement will go into effect.

The statement for the quarter ending Dec. 31 is as follows:

	1886.	1885.	Inc. or Dec.	P c.
Earnings	$1,188,576	$957,136	I. $231,440	24.1
Expenses	749,285	614,900	I. 134,385	21.8
Net earnings	$439 291	$342.236	I. $97,055	28.3
Charges	93.510	103,507	D. 9,997	19.6
Net income	$345,781	$238,729	I. $107,052	44.8

The balance sheet shows cash on hand $940,665.

New York & New England.—Surveys are being made for a line from Holycke, Mass., through Chicopee and Chicopee Falls to connect with this road at Springfield, some of the Holyoke manufacturers feeling that their present connections with tidewater and the coal fields, although ostensibly competing, are too much under the control of the New York, New Haven & Hartford.

New York, New Haven & Hartford.—Henry L. Goodwin, of East Hartford, has formulated specific charges against the fiscal management of this company. He claims many irregularities and omissions in the sworn returns for 1886 of the road to the Railroad Commissioners. These returns, he says, make the net earnings of the company appear to be upward of $520,000 less than they actually were, or less than 14 per cent. on the capital stock, whereas they were upward of 17 per cent. The officers have omitted from the return of gross earnings the sum of $87,046, which in their report to the stockholders of the company they say was the income of what they call a sinking fund. The company has omitted from its "statement of total expenditures" the expenditure of upward of $115,000 made the past year in a manner wholly unauthorized by its charter.

The expenditure of $440,494 has been concealed even from the stockholders, and has been covered up by marking off a corresponding amount from the reported value of 12,298 shares of the stock of the New Haven & Northampton Co., which shares constitute a part of the so-called sinking fund. The cost of additional equipment could not have been less than $250,000, yet none of this cost has been returned as an expenditure for equipment. The company has expended during the year upward of $20,000 for the purchase of land, and returned the same as having been expended for repairs of the road-bed. It has also expended some $165,000 for admitted "betterments," all of which it has returned as having been expended for "operating expenses."

Norfolk & Western.—This company began work on a branch road Feb. 16 from Graham, Va., mining town to Tazewell Court House, a distance of 25 miles, which will open up one of the richest mineral and grazing sections of the state. Coal, iron, lead, zinc, and other minerals have been discovered on the line of the road.

Ogdensburg & Lake Champlain.—The statement for the quarter ending Dec. 31, as submitted to the State Railroad Commission, is as follows:

	1886.	1885.	Inc. or Dec.	P. c
Earnings	$183,130	$152,605	I. $30,525	20.0
Expenses	104,778	77,218	I. 27,560	35.6
Net earnings	$78,352	$75,387	I. $2,965	3.9
Charges	58,457	51,849	I. 6,608	12.7
Net income	$19,895	$23,538	D. $3,643	15.4

For the quarter the gross earnings show increase of 20 per cent., and the expenses 35.6 per cent., leaving a gain of 3.9 per cent. in net earnings.

Ohio Valley Construction Co.—Work will commence soon on the Great Kanawha Bridge at Point Pleasant, W. Va. The pneumatic foundation will be sunk by the well-known hydraulic engineers and contractors, Sooysmith & Co., of New York.

Oregon Railway & Navigation.—The Oregon Legislature has again passed the bill authorizing this company to build a bridge over the Willamette at Portland. This is over the veto of Governor Pennoyer.

Panama.—This company has come to an agreement in its differences with the Pacific Mail Steamship Co. The latter will pay $150,000 in settlement of a disputed claim of $500,000, and the monthly payment for transportation across the Isthmus is to be $55,000 instead of $70,000. The contract awaits the approval of M. de Lesseps.

Pennsylvania.—In the suit of Edgar Miller against this company for infringement of the Janney Platform Coupler, the jury has found for the plaintiff in the amount of 6 cents, no appeal. The suit was for $300,000.

Peoria, Decatur & Evansville.—This company has given a mortgage for $2,085,000 to the Central Trust Co., of New York, and William A. Heilman, of Evansville, Ind., payable in New York in 1996 and drawing 5 per cent. interest. It is signed by D. J. Mackey, President, and L. M. Schwan, Secretary.

Philadelphia & Reading.—President Corbin has ordered that hereafter the conductors on this road shall be paid in cash. The scheme of retaining a certain percentage of their salaries and converting the same from time to time into stock, which was inaugurated in 1883, has been abolished, and the salary list is to be entirely readjusted. At present the President of the company, as trustee, is holding about 270 shares of stock and about $75,000 in money, which will be paid over to the men when they leave the road.

President Corbin has issued a second notice to holders of the company's securities calling attention to the fact that the time for the deposit of securities under the proposed plan of reorganization will expire on March 1. He states in his circular-letter that, if enough securities have not been deposited before that date to warrant reorganization without foreclosure, the plan provides that foreclosure and sale will be resorted to in the exclusive interest of those who have become parties to the agreement at that time. The letter says:

The Court has declared that no unnecessary delays will be permitted, and unless reorganization be promptly effected it will feel at liberty to vacate the receivership. It is most important for all interests that such a contingency should be avoided.

Pittsburgh, Chicago & Missouri River.—This company has been incorporated in Illinois to build a road from Hyde Park, Cook County, through the town of Lake into Chicago. Also from Hyde Park through the town of Calumet, Blue Island, Worth, Palos and Lemont, in Cook County, and through Lockport and Plainfield to the Missouri River. Offices at Chicago. Capital stock, $2,000,000.

This company has been incorporated at Springfield, Ill., with a capital stock of $2,000,000.

Rome & Decatur.—Work on this road progresses rapidly. The first 15 miles of track are nearly laid, with 25 miles of the road-bed graded. From Rome to Gadsden, Ala., the road will be 55 miles long.

St. Louis, Arkansas & Texas.—President S. W. Fordyce, of this company, has written a letter to the Mayor of Shreveport, La., in which he proposes the extension of the lines of his road to that city. He asks the city for right of way from the Louisiana line, and for depot ground in the city with terminal facilities, and if this is accorded, agrees to begin work at once from Lewisville, or from Magnolia, as the surveys indicate the best line. Mr. Fordyce has been invited to Shreveport to meet the people.

San Bernardino & Los Angeles.—Track has been laid on this extension of the Atchison, Topeka & Santa Fe system from San Bernadino, Cal., north 5 miles, and grading is completed for some distance ahead.

San Francisco & North Pacific.—This company's extension from Cloverdale to Ukiah, and from Marin to Napa, Cal., has been completely surveyed, and active work will be commenced this month. Rails and ties for completing the road are now on hand.

San Pablo & Tulare Extension.—This company has filed articles of incorporation at San Francisco, Cal. It is proposed to build a narrow-gauge line in the counties of San Joaquin, Stanislaus, Mercedes, Fresno, Tulare and Kern, commencing at Tracy, in San Joaquin County, connecting there with the San Pablo & Tulare road, and running southeasterly to Tampa, in Kern County, distant 260 miles. Capital stock, $8,000,000.

Savannah, Florida & Western.—This company's mechanic and blacksmith shops at Savannah, Ga., have been consumed by fire. Loss, $70,000.

Southern Kansas.—Mr. J. S. Leeds, General Freight Agent of the Arkansas City Extension of this line, which was temporarily opened for commercial business between Arkansas City, Kan., and Cow Creek, I. T., gives notice that the extension is now closed and all rates are canceled.

Southern Pacific.—The California & Oregon extension, Shasta Division, is open for traffic to Montague, Cal., 22 miles north of Edgewood, the previous terminus. This is an extension of 14½ miles of track in 1887, and brings the road to a point 351 miles north of San Francisco. The Ventura Division is open from Saugus, Cal., the junction of the main line, 32 miles north of Los Angeles, west to Santa Paula, 34 miles distant. Track has been laid 4 miles beyond Santa Paula.

It is reported that the San Joaquin ranch at Santa Anna, Cal., containing 400,000 acres of land, has been sold to a syndicate representing this company for $1,250,000.

Sturgis & State Line.—The directors of this company have given the contract for building the road to William Dallin, of Chicago, who also has the contract for building the Battle Creek & Sturgis and the Indianapolis and Southern roads, making a continuous line from Battle Creek to St. Louis, Mo. Work will commence by March 1, and is expected to be completed by Dec. 1.

Tennessee Coal, Iron & Railroad.—This company has filed mortgages amounting to $6,400,000 in the probate offices at Blountsville, Ala. They were for money which the company borrowed from the American Loan and Trust Co., of New York. A large portion will be invested in Blount County mineral lands.

Texas Mexican.—A copy of judgment for $180,194, with a foreclosure of a deed of trust against this company, has been filed with the sheriff of Galveston County, Tex., with instruction to sell, March 1, the company's property.

Union Pacific.—It is reported that this company is about to build a road from Rock Springs, Wyoming Ter., northwest across the Big Sandy and Green rivers to Jackson's Lake, and thence to the Yellowstone Park in Colorado.

Virginia Western.—An engineering corps, under the charge of Major H. D. Whitcomb as Chief Engineer, is organizing to go into the field to locate surveys. A part of the line extending from some point on the Richmond & Allegheny road near Buchanan, Va., through the counties of Boutecourt, Craig, Giles, Bland, Tazwell, Russell, Wise, Scott and Lee to the Tennessee State line has already been examined, and now the work will be prosecuted actively to a connection with the surveys being extended by the Tennessee Midland Co. from the Virginia State line to Memphis. It is the plan of the managers of these two companies to construct their respective roads with a view to a continuous line to the triple connection offered on the upper James River by the Richmond & Allegheny, the Shenandoah Valley and the Baltimore & Ohio roads.

Wabash, St. Louis & Pacific.—The name of the new company which will have possession of the lines of this system west of the Mississippi River is to be the Wabash, St. Louis & Western. The Purchasing Committee is to go to St. Louis next week to conform to the requirements of the U. S. Court in respect to paying a certain sum of money into the registry preparatory to taking formal possession of the property.

By order of General Manager Talmage the force at all the shops of this system which still remain under his management have been cut down 25 per cent.

West Shore.—This company has a survey for its Kaaterskill branch in active progress, an elevation of 600 ft. having been already reached in Platterkill Clove, N. Y. From this point to the Kaaterskill Hotel there will be an ascent of nearly 3,000 ft. The company is making another survey for a branch to Richfield Springs, N. Y., by the way of Palenville and Middleburg.

Worcester & Hudson.—Two routes are under consideration for the line of this new company's road. One would go from Worcester, Mass., to North Grafton, then to Northborough, and so continue to Hudson. The other differs only slightly, except that it passes through South Shrewsbury. The cost of the road is estimated at $800,000. Engineers have made an examination of the proposed route of entrance into Worcester, and the survey of the western end of the road was begun this week.

ANNUAL REPORTS.

Denver & Rio Grande.

This company owns a line of road from Denver, Col., to the Utah border, 461 miles, with other divisions and branches of 850 miles; a total of 1,311 miles. The statement is for the year ending Dec. 31.

The earnings for the year were as follows:

	1886.	1885.	Inc or Dec.	P. c.
Earnings	$6,738,077	$6,119,053	I. $619,023	10.1
Expenses	4,227,416	3,935,273	I. 292,143	7.4
Net earnings	$2,510,660	$2,183,780	I. $326,880	14.9
Gross earn. per m.	5,139	4,667	I. 472	10.0
Net " "	1,915	1,665	I. 250	14.7
Per cent. of exps.	62.7	64.3	D. 1.6	....

Taxes and insurance last year amounted to $254,740, leaving a total income of $2,245,920.

Rome, Watertown & Ogdensburg.

This company owns a line from Suspension Bridge to Norwood, N. Y., 286 miles, with 163.7 miles of branches; a total of 449.7 miles. The statement is for the year ending Sept. 30.

The earnings for the year were as follows:

	1886.	1885.	Increase.	P. c.
Earnings	$2,406,793	$1,732,732	I. $704 061	41.3
Expenses	1,395.117	1,095,053	I. 300.064	27.4
Net earnings	$1,011,676	$607,679	I. $403,997	66.4
Gross earn. per mile	4.457	3,153	I. 1,304	40.7
Net " " "	1,873	1.125	I. 748	68.0
Per cent. of expenses	57.9	64.3	D. 6.4	....

In the above statement the operation of the Utica & Black River road is included for the last six months of 1886, and the earnings per mile are estimated accordingly.

Income from other sources last year was $29,749, making the total net $1,041,424. Fixed charges, taxes and rentals were $793,661, leaving a surplus of $247,763 for the year.

Cincinnati, New Orleans & Texas Pacific.

This company leases the Cincinnati Southern road, extending from Cincinnati, O., to Chattanooga, Tenn., 336 miles. The statement is for the year ending Dec. 31.

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$2,882,172	$2,681,547	I. $200,625	7.4
Expenses	1,753,879	1,616,735	I. 137.144	8 4
Net earnings	$1,128,293	$1,064.812	I. $63,481	5.9
Gross earn. per m.	8.577	7,980	I. 597	7.4
Net " " "	3,358	3.169	I. 188	5.9
Per cent. of exps.	60.8	60.3	I. 0.5	...

Payments for taxes and rental amounted to 913,743, leaving a surplus of 214,549. The expenditures for rolling stock, improvements and additions, and for change of gauge were $211,996, leaving a balance after providing for the payment of taxes and rentals of $2,553.